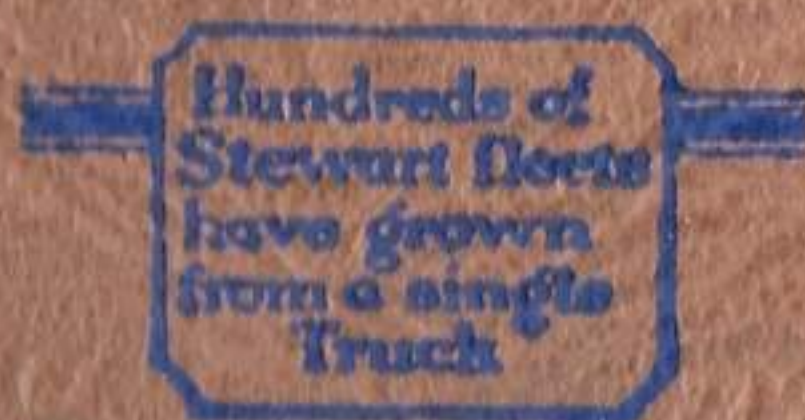


Stewart

MOTOR TRUCKS

SALES MANUAL

FEBRUARY 1, 1930



Covering Models

**30, 30X, 16A, 16XA, 28, 28X, 29, 29X, 29XW,
26XW, 32X, 18X, 33X, 19X, 31X and 27X**

**Stewart Motor Corporation
Buffalo, N. Y.**

Stewarts are 5 to 10 Year Trucks

*THIS Manual has been prepared
for the exclusive use of Stewart
Distributors, Dealers and Salesmen.*

*We recommend that each man read
the contents carefully, for within
these pages are many valuable sell-
ing helps, and detailed specification
which permit a salesman to thorough-
ly understand Stewart Trucks.*

Knowledge is Power !

Posted on: January 26, 2020
Edited by; Brian D. Szafranski; Elma New York USA
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Prices and Specifications subject to change
without notice.

Printed in U.S.A.

The Stewart Organization

The Stewart Motor Corporation was organized and began the manufacture of Stewart Motor Trucks in 1912. From a small beginning the corporation has grown rapidly until today it ranks high on the list of American truck makers.

The Board of Directors of the Stewart Motor Corporation is composed of three men, namely, T. R. Lippard, President; R. G. Stewart, Vice-President, and R. P. Lentz, Secretary and Treasurer. These men were the organizers of the company and today are in active control of the business.

Included in the organization are also many experienced men such as superintendents, department heads, and foremen, who have had many years of experience in building motor trucks.

Both Dun's and Bradstreet's credit rating of the Stewart Motor Corporation is the highest rating given to any concern in their books, which is a first grade credit rating of \$1,000,000 and over.

There are about 130 truck makers in the United States, yet less than 25 makers are producing approximately 85 per cent of all the motor trucks. The Stewart ranks high on this list of 25.

There are many thousands of Stewart trucks in operation in the United States and 56 foreign countries. Many owners have repeated from time to time until today they have large fleets of Stewart trucks. The policy of the Stewart has always been to build a good truck at a moderate price—one that would render the owner satisfactory service for years. Stewarts are not one year trucks made to sell at a price.

The Stewart Factory

The Stewart factory is one of the most modern in the truck industry, having a capacity of 50 trucks per day. Stewart trucks are built on the progressive system, the final assembly building being equipped with four rows of industrial tracks, each track being approximately 400 feet long. Each track is equipped with modern quick drying paint ovens, overhead trolley system and other labor saving devices. All Stewart trucks are beautifully painted in standard colors. Many trucks of other makes, as you know, are sold simply in the lead—an extra charge being made for painting.

Our Wood-working Plant is equipped with modern labor saving devices and machinery. All Stewart bodies, cabs and woodwork are manufactured in our own body plant. Both Stewart chassis and bodies are finished much better than many passenger cars.

All Stewart distributors, dealers and salesmen should urge the purchase of Stewart standard bodies, as they are best adapted to the various chassis as to size, weight and appearance.

SPARE PARTS DEPARTMENT

Our Spare Parts Department is one of the most complete in the industry. Our policy is to fill all orders, telegraphic or otherwise, from dealers and customers, the day the order is received. We carry at all times parts for any Stewart truck ever made, whether in current production or obsolete.

Our parts catalogs are beautifully and profusely illustrated, making it very easy for the dealer or customer to readily determine the part desired. No manufacturer in the industry supplies his dealers with better parts catalogs.

All Stewart spare parts prices are exceedingly reasonable. Discourage owners from using pirate or imitation parts made simply to sell at a small price. Encourage owners to use genuine Stewart parts only. A poor imitation part may cause the owner much expense and serious damage to other parts of his truck.

THE FUTURE OF THE TRUCK INDUSTRY

During the past ten years the truck industry has been in its infancy, or the pioneer period. More than 3,000,000 motor trucks have been produced to date—enough to convince everyone that the motor truck is here to stay. Millions of motor trucks will be sold within the next few years and many of the great fortunes that have been made by dealers and salesmen with the passenger car in the past will be duplicated in the future with the truck.

Truck registrations in 1913	were	64,000
" " " 1914	"	85,000
" " " 1915	"	140,000
" " " 1916	"	198,000
" " " 1917	"	289,000
" " " 1918	"	433,000
" " " 1919	"	749,000
" " " 1920	"	975,000
" " " 1921	"	1,050,000
" " " 1922	"	1,375,000
" " " 1923	"	1,612,569
" " " 1924	"	2,134,724
" " " 1925	"	2,441,709
" " " 1926	"	2,764,222
" " " 1927	"	2,906,000
" " " 1928	"	3,156,000
" " " 1929	"	3,370,000

STEWART GUARANTEE

WE WARRANT the new motor trucks manufactured by us to be free from defects in material and workmanship, this warranty being limited to making good at our factory any part or parts thereof which shall, within ninety (90) days after delivery of the truck to the original purchaser, be returned to us with transportation charges prepaid, and which our examination shall disclose to our satisfaction to have been defective.

We make no warranty whatever in respect to tires, rims, ignition apparatus, lamps, gas tanks, signaling devices, generators, batteries or other trade accessories, inasmuch as they are usually warranted separately by their respective manufacturers.

Stewart Motor Corporation
Buffalo, N. Y.

Care of Stewart Trucks

THINGS TO DO EVERY DAY

1. Fill the radiator with water.
2. Examine the oil level in motor.

THINGS TO DO EVERY 250 MILES

1. Alemite all grease connections.

THINGS TO DO EVERY 500 MILES

1. Tighten all spring clip bolts.
2. Fill universal joints with lubricant.
3. Add lubricant to rear axle.
4. Add lubricant to transmission.
5. Examine clutch pedals to see that they are not striking toe boards.
6. Adjust fan belt.
7. Inspect and adjust brakes.
8. Inspect water hose connections for leaks.
9. Draw off old motor oil and replenish with new supply.

THINGS TO DO EVERY 1,000 MILES

1. Clean out carburetor screen.
2. Remove all wheels, adjust bearings and lubricate them.
3. Drain out radiator and water circulating system to remove sediment and dirty water. Refill with clean water.
4. Adjust steering gear.
5. Inspect and adjust valves.
6. Drain gasoline filter and clean strainer.

THINGS TO DO EVERY SEASON

1. Open up springs and coat all leaves with good grade of graphite lubricant to prevent rusting.

MODEL 30—1 TON**Specifications**

Rated Capacity	- -	2000 pounds.
Wheelbase	- - - -	120" - 130" - 140".
Body Length	- - -	7 feet to 9 feet.
Track	- - - - -	Front 59". Rear 60".
Tire Equipment	- -	Standard—front 6.50 balloon—6 ply. Rear 6.50 balloon—6 ply single or 30" x 5"—6 ply high pressure. Dual rear wheels equipped with either of the above tires at extra cost.
Turning Radius	- -	On standard wheelbase 23'.
Chassis Weight	- -	On standard wheelbase 2905 lbs.
Engine	- - - - -	Four cylinder, 3 $\frac{3}{4}$ " bore x 4 $\frac{1}{2}$ " stroke. Piston displacement 199 cu. in. S.A.E. horsepower 22.5. Actual horsepower 50 at 2600 R.P.M. Maximum torque 136 foot pounds at 1050 R.P.M. Cooling by centrifugal pump.
Carburetor	- - - -	Stromberg S.A.E. 1" flange.
Rear Axle	- - - -	Ratio 5.6-1 standard. Special ratio of 6.62-1 at extra cost.
Transmission	- - -	Four speed. Ratios: Low 6.40-1, Second 3.09-1, Third 1.69-1, Fourth is direct drive, Reverse 7.82-1.
Brakes	- - - - -	Bendix 4 wheel brakes, Duo-Servo type, internal expanding operated by foot pedal. Hand brake on transmission, external contracting. Size 8" diameter x 2 $\frac{1}{2}$ " wide.
Gasoline Tank	- -	Capacity 15 gallons. Located under driver's seat. Stewart Vacuum system.

Frame - - - - - Depth 6", width of flanges $2\frac{1}{4}$ ", thickness $\frac{5}{32}$ ", on 130" and 140" wheelbase. Width overall 32". On the 120" wheelbase frame depth is 5", width of flange $2\frac{1}{4}$ ". Thickness $\frac{5}{32}$ ".

Front Springs - - - Length 38 $\frac{1}{2}$ "— $2\frac{1}{4}$ " wide—10 leaves of alloy steel.

Rear Springs - - - Length 50"— $2\frac{1}{2}$ " wide—11 leaves of alloy steel.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric horn and battery; vacuum tank with booster and gasoline filter; tool kit, jack, rear tire carrier, spare rim, carburetor air cleaner, thermostat, stop light and Alemite grease gun. The instrument board is equipped with ammeter, oil gage, starting choke button, lighting and ignition switches and dash light. Windshield wiper and mirror on all bodies and cabs, speedometer.

Model 30, Mechanical Description

ENGINE: The engine is a new design, four cylinder type, size $3\frac{3}{4}$ " x $4\frac{1}{2}$ ". It has a maximum torque of 136 foot pounds at 1050 R.P.M. and develops 50 brake horsepower at 2600 R.P.M. It is the "L" head type with crankcase and cylinder cast integral. The cylinder head is removable. The oil pan is a removable pressed steel part. The motor has a three point suspension—the front support resting on a rubber block.

THE OILING SYSTEM is the full pressure feed type and is operated by a gear pump driven from the cam shaft by a set of spiral gears. Pressure oil feed is provided for crankshaft bearings, connecting rod bearings and cam shaft bearings. The oil pump is located on the right hand side of the motor toward the rear. The oil pressure is controlled by a regulator valve which gives constant oil pressure at all engine speeds.

THE CRANKSHAFT is $2\frac{1}{8}$ " diameter and has three large main bearings which are bronze backed and babbitt lined.

Size of front crankshaft bearing $2\frac{1}{8}$ " x $2\frac{11}{16}$ ".

Size of center crankshaft bearing $2\frac{1}{8}$ " x $2\frac{3}{16}$ ".

Size of rear crankshaft bearing $2\frac{1}{8}$ " x $2\frac{3}{8}$ ".

The crankshaft is forged from high grade alloy steel, is carefully balanced both statically and dynamically, heat treated, machined and ground to size.

THE CAM SHAFT is $1\frac{1}{8}$ " in diameter and is supported by four large bearings. It is forged from the best grade alloy steel, heat treated, machined and cams ground to size. The cam shaft is driven by means of helical spur gears which have long life and require no adjustment.

Size of front cam shaft bearing 2.03" x $1\frac{1}{2}$ ".

Size of second cam shaft bearing 1.99" x 1".

Size of third cam shaft bearing 1.95" x 1".

Size of fourth cam shaft bearing 1.94" x $1\frac{5}{8}$ ".

CONNECTING RODS are "I" beam section, made of open hearth steel, drop forged and heat treated. The rods are 9" long and the upper end is provided with a clamping lug to clamp the piston pin. The bearing on the large end is $2\frac{1}{8}$ " diameter by $1\frac{1}{2}$ " long and is the cast in babbitt type.

THE VALVES are located on the right hand side of the motor and are easily reached by removing the cover plates. The tappet clusters are also removable. The exhaust valves are silicrome steel. The lift of valves is $\frac{5}{16}$ ". The diameter of the intake port is $1\frac{1}{2}$ ", diameter of exhaust port $1\frac{3}{8}$ " and angle of valve seat 45° .

THE WATER PUMP is a centrifugal type, located at the front end of the cylinder block and is driven by the fan belt.

THE RADIATOR FAN is 15" in diameter, has four pressed steel blades carefully balanced and runs on annular bearings. It is driven by a $\frac{3}{4}$ " "V" type rubber belt which has a 38° included angle. The fan pulley is $4\frac{5}{8}$ " diameter and the drive pulley on the crankshaft is $5\frac{1}{2}$ " diameter. The fan is surrounded by a shroud.

THE FLY WHEEL is a semi-steel casting and is $12\frac{1}{4}$ " in diameter with a steel ring gear pressed on the outer rim for the starter. It weighs $57\frac{1}{2}$ lbs., and is carefully balanced to eliminate vibration. It is machined for an 11" diameter single plate clutch.

THE PISTONS are the DeLuxe, light weight type. They are $4\frac{1}{2}$ " long and each is fitted with four piston rings $\frac{3}{16}$ " wide. The rings are the concentric perfect circle type. The top three are plain while the lower one is an oil ring. The piston pins are $\frac{7}{8}$ " diameter.

THE SPARK PLUGS are located in the top of the cylinder head. They are standard S.A.E. $\frac{7}{8}$ "—18 thread plugs.

THE LIGHTING GENERATOR is a Delco-Remy unit delivering a six volt current. It is attached to the motor on the right hand side by a standard S.A.E. flange on the gear case housing and is driven by the engine timing gears. The rotation is clockwise. The generator rotates at $1\frac{5}{27}$ crankshaft speed.

THE DISTRIBUTOR is located on top of the engine. It is driven off the cam shaft by means of a set of spiral gears. Viewed from the top the rotation is counter clockwise.

THE STARTING MOTOR is located on the left hand side of the engine at the rear. It is attached to the front face of the fly wheel housing by S.A.E. Standard flange type mounting. The starter has a Bendix drive with out-board bearing and meshes with teeth in the ring gear of the fly wheel.

THE IGNITION is by battery on standard equipment but a magneto equipped unit can be furnished on special order at extra cost.

THE TRANSMISSION is of the unit power plant type which bolts directly to the flywheel housing of the motor. The control set which consists of the gear shift lever and hand brake lever are mounted on the cover plate of the transmission. The transmission case is made of cast iron.

The gears are 7 pitch and 7-9 pitch and their width varies from $\frac{5}{8}$ " to $1\frac{1}{16}$ " according to the loads they carry. They are made from high grade alloy steel and are heat treated to give maximum strength.

The main shaft is $1\frac{1}{2}$ " in diameter and is supported on annular ball bearings. The front bearing is No. 1209 and the rear bearing is No. 1307. The main shaft has six heavy splines which drive the gears.

The countershaft gears are forged in one piece of high grade alloy steel specially heat treated to give maximum strength. The gear unit is mounted on two long roller bearings which in turn run on a 1" shaft which is locked to the transmission case. The part number of the roller bearing is WS7640. The transmission has an opening for power take off or tire pump.

The gear ratios are as follows:

Low—6.40-1	Third—1.69-1	Reverse—7.82-1
Second—3.09-1	Fourth—1.00-1	

Using the standard 5.6-1 rear axle ratio the following reductions are obtained at the rear wheels:

Low—35.84-1	Third—9.46-1	Reverse—43.79-1
Second—17.30-1	Fourth—5.6-1	

CLUTCH is a single plate type, Borg and Beck. It is adjustable for wear, and has a very smooth action. The clutch plate is 11" diameter. It has a vibration dampener, which eliminates noise. The facings are molded giving extra long life.

THE FRONT AXLE is of the reverse Elliott type with drop forged, heat treated steel "I" beam, $1\frac{5}{8}$ " by $2\frac{1}{4}$ " deep. The nickel steel spindles for the wheels are $1\frac{1}{2}$ " diameter at the inside bearing and $\frac{7}{8}$ " diameter at the outside bearing. The axle pivot bolt is $\frac{7}{8}$ " diameter, hardened and ground. The steering ball on the arm is $1\frac{1}{8}$ " diameter. The steering cross tube is $1\frac{1}{8}$ " diameter seamless steel tubing and is equipped with special design, ball and socket joints, which prevent cramping. The spindle and wheel bearings are the latest type Timken roller bearing. The tread is 59". The steering arms both sides, are forged from nickel steel and heat treated.

THE REAR AXLE is a spiral bevel gear semi-floating type. The axle housing is a banjo one piece, cast housing, and very strong. The spiral bevel pinion is straddle mounted. It is carried at the front end on a double row annular ball bearing No. 5308. The rear end is carried on a single row annular ball bearing No. 1306. The bevel pinion and ring gear are made from the best quality $3\frac{1}{2}\%$ nickel steel. The two pinion differential is mounted on two Timken taper roller bearings, No. 366-363. There are 7 teeth in the pinion and 39 in the ring gear which gives a rear axle gear reduction of 5.6-1. The rear axle shafts are made from nickel steel and are heat treated. The diameter of the axle shaft at the hub is 2". The shaft is splined at the differential end, while the wheel end is tapered where the wheel is mounted and furnished with a long square key to take the drive. The drive shaft wheel bearings are double row Timken No. 372A-375 bearings. They are held in bearing cups which are threaded for adjustment. The tread is 60" on single tires and 61" on duals.

THE DRIVE SHAFT is made from high carbon, heat treated, seamless steel tubing. This tubing is carefully balanced at high speed for true running. The tube diameter for the 130" wheelbase is 3" and the wall thickness is $\frac{3}{32}$ ". The tube diameter for 120" and 140" wall thickness is 2" and the wall thickness is $\frac{5}{32}$ ". The 120 and 130" wheelbase chassis take two joint drive

shaft assemblies while the 140" wheelbase chassis takes a three-joint assembly with center bearing. The Universal joints are all metal type, and have hardened and ground pins and bushings. The joint cases are made from pressed steel and are tightly enclosed to prevent the leakage of lubricant.

FOOT BRAKES are the Bendix Duo-Servo type which have a very powerful action without requiring excessive foot pressure. They are internal expanding and are entirely enclosed both front and rear and are mechanically operated by the foot pedal. They are lined with a molded lining which gives them long life.

The braking effort is so distributed that 65% goes to the rear brakes and 35% goes to the front brakes. The front brakes are 14" x 2" and the rear brakes are 14" x 2".

THE HAND BRAKE is located at the rear end of the transmission. It is an external contracting band type. It is easily adjusted and requires little attention. The band is 8" diameter by 2½" wide, and is provided with an adjustment for taking up wear.

STEERING GEAR is the Ross cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is 1½" diameter, is made of seamless steel tubing and finished with baked black enamel. The steering wheel is 17" diameter. The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is 1⅛" diameter, hardened and ground to size. A large horn button is mounted in the center of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated. The

front springs are $38\frac{1}{2}$ " long by $2\frac{1}{4}$ " wide. The rear springs are 50" long by $2\frac{1}{2}$ " wide. The front spring pins are $\frac{3}{4}$ " diameter and the rear pins 1" diameter.

THE FRAME is made of special analysis open hearth steel. The side rails are 6" deep for 130" and 140" wheelbase, 5" deep for 120" wheelbase at the center section, having $2\frac{1}{4}$ " flanges and are made from steel $\frac{5}{32}$ " thick. The cross members are made with integral gussets and are hot riveted in place. The width of the frame is 32". The length depends upon the wheelbase.

THE RADIATOR is pressed steel, shell type with black enamel finish. The upper and lower tanks and core are made up in one unit. The core is the cellular type. It is suspended in the radiator shell by means of side supports bolted to the shell. The radiator has a frontal area of 400 square inches. The core is $2\frac{1}{4}$ " thick. The water capacity of the radiator and motor is approximately $5\frac{1}{2}$ gallons. Chromium plated shell may be had at extra cost.

THE THERMOSTAT regulates the temperature of the water in the engine. It is inserted in the water manifold on top of the cylinder head between the motor and the radiator. When the water is cold, the thermostat valve is closed. This cuts off the water circulation until the water in the engine becomes hot. At which time the thermostat valve commences to open and again allows water circulation. At about 175 degrees temperature the valve is fully open, in which position it will stay until the water again commences to cool off, when it will automatically close.

STORAGE BATTERY is a six volt type, 87 ampere hour capacity. It has a molded hard rubber case and is mounted in a suitable bracket attached to the frame side rail. The battery is held by means of two clamp bolts. The battery is easily removable.

THE WHEELS are the malleable steel type with six spokes, both front and rear. The spokes are hollow and the wheels very strong, although they are but very little heavier than ordinary wood wheels.

THE TIRES are 6.50"-20" base, balloons standard equipment, 30x5 high pressure tires are optional at no extra cost.

Dual rear wheels equipped with either of the above tires are available at additional cost.

GASOLINE TANK is located under the driver's seat. The capacity is 15 gallons. The tank is constructed of No. 20 gauge terne plate. The header plates are stamped in a dished section and fastened in place by a lapped and rolled seam which is also soldered. Stewart vacuum system is used.

HEADLIGHTS are the new type having controllable beam. The large bulb has double filaments and produces the high or long distance light for country work on the lower filament, while the upper filament produces a short flood light for city driving. An additional bulb with single filament furnishes parking lights.

The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell finish is baked black enamel and the rim finish is chromium plate.

The lens comply with all state requirements.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing points and a high pressure Alemite gun furnished with each truck as standard equipment.

PAINT: All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.

MEMORANDUM

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MODEL 30X—1 TON**Specifications**

- Rated Capacity - - 2000 pounds.
- Wheelbase - - - - 120" - 130" - 140".
- Body Length - - - 7' to 9'.
- Track - - - - - Front 59". Rear 60".
- Tire Equipment - - Standard. Front 6.50 balloon—6 ply. Rear 6.50 balloon—6 ply single or 30" x 5"—6 ply high pressure. Dual rear wheels equipped with either of the above tires at extra cost.
- Turning Radius - - On standard wheelbase, 23 feet.
- Chassis Weight - - On standard wheelbase, 2965 lbs.
- Engine - - - - - Six cylinder, size $2\frac{7}{8}$ " x $4\frac{3}{4}$ ".
Piston displacement 185 cu. in.
S.A.E. horsepower 19.8. Actual horsepower 55 at 2600 R.P.M.
Maximum torque 121 ft. pounds at 1000 R.P.M. Cooling by centrifugal pump.
- Carburetor - - - - Stromberg S.A.E. 1" flange.
- Rear Axle - - - - Ratio 5.6-1 standard. Special ratio of 6.62-1 at extra cost.
- Transmission - - - Four speed. Ratios, Low 6.40-1, Second 3.09-1, Third 1.69-1, Fourth is direct drive, Reverse 7.82-1.
- Brakes - - - - - Bendix 4 wheel brakes, Duo Servo type, internal expanding operated by foot pedal. Hand brake on transmission, external contracting, size 8" diameter x $2\frac{1}{2}$ " wide.
- Gasoline Tank - - Capacity 15 gallons. Located under driver's seat. Stewart Vacuum system.

- Frame - - - - - Depth 6", width of flanges $2\frac{1}{4}$ ", thickness $\frac{5}{32}$ ", on 130" and 140" wheelbase. Width overall 32". On the 120" wheelbase frame depth is 5", width of flange $2\frac{1}{4}$ " and thickness $\frac{5}{32}$ ".
- Front Springs - - - Length $38\frac{1}{2}$ " — $2\frac{1}{4}$ " wide — 10 leaves of alloy steel.
- Rear Springs - - - Length 50" — $2\frac{1}{2}$ " wide — 10 leaves of alloy steel.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric horn and battery; vacuum tank with booster and gasoline filter; tool kit, jack, rear tire carrier, spare rim, carburetor air cleaner, thermostat, stop light and Alemite grease gun. The instrument board is equipped with ammeter, oil gage, starting choke button, lighting and ignition switches and dash light. Windshield wiper and mirror on all bodies and cabs, speedometer.

Model 30X, Mechanical Description

ENGINE: The engine is a new design truck type unit, with cylinder block and crank case cast integral, "L" head type of cylinders with removable cylinder head. The fly wheel housing is a separate part and is bolted to the crank case. The oil pan is a removable pressed steel part. The motor has the conventional three point suspension with the front end mounted on a rubber block.

THE OILING SYSTEM is the full pressure feed type and is operated by a gear pump driven from the cam shaft by a set of spiral gears. Pressure oil feed is provided for crankshaft bearings, connecting rod bearings and cam shaft bearings. The oil pump is located on the right hand side of the motor toward the rear. The oil pressure is controlled by a regulator valve which gives constant oil pressure at all engine speeds.

THE CRANKSHAFT is $2\frac{3}{8}$ " in diameter and has four main bearings. The rotation, looking at the front of the motor is clockwise. The upper halves of the main crank shaft bearings are white die cast metal alloy and are removable. The lower halves are made of the same material but are pressure cast into the bearing caps.

Size of front crank shaft bearing, $2\frac{3}{8}$ "x $1\frac{7}{8}$ ".

Size of second crank shaft bearing, $2\frac{3}{8}$ "x $1\frac{5}{8}$ ".

Size of third crank shaft bearing, $2\frac{3}{8}$ "x $1\frac{5}{8}$ ".

Size of rear crank shaft bearing, $2\frac{3}{8}$ "x $1\frac{7}{8}$ ".

The crank shaft is carefully balanced both statically and dynamically and heat treated.

THE CAMSHAFT is $1\frac{1}{8}$ " diameter and is supported in five bearings. The camshaft is driven by means of steel helical gears which have exceptionally long life and require no adjustment.

Size of front cam shaft bearing, 2.04 x $1\frac{7}{32}$.

Size of second cam shaft bearing, 2.01 x $\frac{3}{4}$.

Size of third cam shaft bearing, 1.991 x $\frac{3}{4}$.

Size of fourth cam shaft bearing, 1.975 x $\frac{3}{4}$.

Size of rear cam shaft bearing, 1.944 x $1\frac{1}{16}$.

THE CONNECTING RODS are "I" beam section of open hearth steel, drop forged and heat treated. They are $9\frac{1}{2}$ " long and the upper end is provided with a lug to clamp the piston pin. The bearing size is $2\frac{1}{8}$ " diameter by $1\frac{1}{4}$ " long at crank shaft.

THE VALVES are located on the left hand side of the motor and are easily reached by the removal of the one-piece valve cover plate. Both intake and exhaust valves are made of nickel steel. The lift of both valves is $1\frac{1}{32}$ ".

Diameter of intake port, $1\frac{3}{8}$ ".

Diameter of exhaust port, $1\frac{1}{4}$ ".

Angle of valve seat, 45 degrees.

THE WATER PUMP is located on the right hand side of the motor, just back of the center of the cylinder block. The pump is the conventional centrifugal pump. It is attached to the side of the cylinder block for support and is driven by means of a flexible hose coupling from the rear of the generator shaft.

THE RADIATOR FAN has four pressed steel blades. It is located on a vertical, adjustable bracket on the front end of the cylinder block. It is driven by a V type fan belt which is $\frac{5}{8}$ " wide across the top. The included angle of the fan belt is 38 degrees. The lower pulley located on the crank shaft is $5\frac{1}{4}$ " diameter and the fan pulley is 4" diameter.

THE FLYWHEEL is cast from semi steel and is $12\frac{1}{4}$ " outside diameter. It is provided with machined teeth on the outside rim for the starter. It is also machined to take a 11" single plate type clutch.

THE PISTONS are made of fine gray cast iron. They are $3\frac{1}{2}$ " long and are fitted with four piston rings, $\frac{3}{16}$ " wide. The top rings are plain, the third and fourth are special oil rings used for the purpose of preventing oil pumping. The piston in is $\frac{7}{8}$ " diameter.

THE SPARK PLUGS are located in the top of the cylinder head. They are $\frac{7}{8}$ " 18 U.S.F. thread.

THE LIGHTING GENERATOR is a Delco-Remy unit delivering a six volt current. It is attached to the motor on the right hand side at the front by standard S.A.E. flange on the gear case housing and is driven by the front timing gears. The generator rotates at $1\frac{1}{3}$ times crank shaft speed. Rotation looking at the driving end of the generator is clockwise.

THE DISTRIBUTOR is mounted on top of the cylinder head, about the center of the block. It is driven from the cam shaft by means of a set of spiral cut gears. Looking down on the top of the distributor, the rotation is anti-clockwise.

THE STARTING MOTOR is mounted on the right hand side of the motor at the rear. It is attached to the front face of the fly wheel housing by S.A.E. Flange type mounting. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the fly-wheel.

THE STANDARD IGNITION is by battery, but a magneto equipped unit can be furnished on special order.

THE TRANSMISSION is of the unit power plant type which bolts directly to the flywheel housing of the motor. The control set which consists of the gear shift lever and hand brake lever are mounted on the cover plate of the transmission. The transmission case is made of cast iron.

The gears are 7 pitch and 7-9 pitch and their width varies from $\frac{5}{8}$ " to $1\frac{1}{16}$ " according to the loads they carry. They are made from high grade alloy steel and are heat treated to give maximum strength.

The main shaft is $1\frac{1}{2}$ " in diameter and is supported on annular ball bearings. The front bearing is No. 1209 and the rear bearing is No. 1307. The main shaft has six heavy splines which drive the gears.

The countershaft gears are forged in one piece of high grade alloy steel specially heat treated to give maximum strength. This gear unit is mounted on two long roller bearings which in turn run on a 1" shaft which is locked to the transmission case. The part number of the roller bearing is WS7640. The transmission has an opening for power take off or tire pump.

The gear ratios are as follows:

Low—6.40-1	Third—1.69-1	Reverse—7.82-1
Second—3.09-1	Fourth—1.00-1	

Using the standard 5.6-1 rear axle ratio the following reductions are obtained at the rear wheels:

Low—35.84-1 Third—9.46-1 Reverse—43.79-1
Second—17.30-1 Fourth—5.6-1

THE CLUTCH is a single plate type, Borg and Beck. It is easily adjustable for wear, and has a very smooth action. The clutch plate is 11" diameter. It has a vibration dampener, which eliminates noise. The facings are molded giving extra long life.

THE FRONT AXLE is of the reverse Elliott type with drop forged, heat treated steel "I" beam, $1\frac{5}{8}$ " by $2\frac{1}{4}$ " deep. The nickel steel spindles for the wheels are $1\frac{1}{2}$ " diameter at the inside bearing and $\frac{7}{8}$ " diameter at the outside bearing. The axle pivot bolt is $\frac{7}{8}$ " diameter, hardened and ground. The steering ball on the arm is $1\frac{1}{8}$ " diameter. The steering cross tube is $1\frac{1}{8}$ " diameter seamless steel tubing and is equipped with special design, ball and socket joints, which prevent cramping. The spindle and wheel bearings are the latest type Timken roller bearing. The tread is 59". The steering arms, both sides, are forged from nickel steel and heat treated.

THE REAR AXLE is a spiral bevel gear, semi-floating type. The axle housing is a banjo one piece, cast housing, and very strong. The spiral bevel pinion is straddle mounted. It is carried at the front end on a double row annular ball bearing No. 5308. The rear end is carried on a single row annular ball bearing No. 1306. The bevel pinion and ring gear are made from the best quality $3\frac{1}{2}\%$ nickel steel. The two pinion differential is mounted on two Timken taper roller bearings, No. 366-363. There are 7 teeth in the pinion and 39 in the ring gear which gives a rear axle gear reduction of 5.6-1. The rear axle shafts are made from nickel steel and are heat treated. The diameter of the axle shaft at the hub is 2". The shaft is splined at the differential end, while the wheel end is tapered where the wheel is mounted and furnished with a long square key to take the drive. The drive shaft

wheel bearings are double row Timken No. 372A-375 bearings. They are held in bearing cups which are threaded for adjustment. The tread is 60" on single tires and 61" on duals.

THE DRIVE SHAFT is made from high carbon, heat treated, seamless steel tubing. This tubing is carefully balanced at high speed for true running. The tube diameter for the 130" wheelbase is 3" and the wall thickness is $3/32$ ". The tube diameter for 120" and 140" wheelbase is 2" and the wall thickness is $5/32$ ". The 120" and 130" wheelbase chassis take two joint drive shaft assemblies while the 140" wheelbase chassis takes a three joint assembly with center bearing. The Universal joints are all metal type, and have hardened and ground pins and bushings. The joint cases are made from pressed steel and are tightly enclosed to prevent the leakage of lubricant.

FOOT BRAKES are the Bendix Duo Servo type brake which have a very powerful action without requiring excessive foot pressure. They are internal expanding and are entirely enclosed both front and rear and are mechanically operated by the foot pedal. They are lined with a molded lining which gives them long life.

The braking effort is so distributed that 65% goes to the rear brakes and 35% goes to the front brakes. The front brakes are 14" x 2" and the rear brakes are 14" x 2".

THE HAND BRAKE is located at the rear end of the transmission. It is an external contracting band type. It is easily adjusted and requires little attention. The band is 8" diameter by $2\frac{1}{2}$ " wide, and is provided with an adjustment for taking up wear.

STEERING GEAR is the Ross cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is $1\frac{1}{2}$ " diameter, is made of seamless steel tubing

and finished with baked black enamel. The steering wheel is 17" diameter. The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is $1\frac{1}{8}$ " diameter, hardened and ground to size. A large horn button is mounted in the center of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated. The front springs are $38\frac{1}{2}$ " long by $2\frac{1}{4}$ " wide. The rear springs are 50" long by $2\frac{1}{2}$ " wide. The front spring pins are $\frac{3}{4}$ " diameter and the rear pins 1" diameter.

THE FRAME is made of special analysis open hearth steel. The side rails are 6" deep for 130" and 140" wheelbase, 5" deep for 120" wheelbase at the center section, having $2\frac{1}{4}$ " flanges and are made from steel $\frac{5}{32}$ " thick. The cross members are made with integral gussets and are hot riveted in place. The width of the frame is 32". The length depends upon the wheelbase.

THE RADIATOR is pressed steel, shell type with black enamel finish. The upper and lower tanks and core are made up in one unit. The core is the cellular type. It is suspended in the radiator shell by means of side supports bolted to the shell. The radiator has a frontal area of 400 square inches. The core is $2\frac{1}{4}$ " thick. The water capacity of the radiator and motor is approximately $5\frac{1}{2}$ gallons. Chromium plated shell may be had at extra cost.

THE THERMOSTAT regulates the temperature of the water in the engine. It is inserted in the water manifold on top of the cylinder head between the motor and the radiator. When the water is cold, the thermostat valve is closed. This cuts off the water circulation until the

water in the engine becomes hot, at which time the thermostat valve commences to open and again allows water circulation. At about 175 degrees temperature the valve is fully open, in which position it will stay until the water again commences to cool off, when it will automatically close.

STORAGE BATTERY is a six volt type, 87 ampere hour capacity. It has a molded hard rubber case and is mounted in a suitable bracket attached to the frame side rail. The battery is held by means of two clamp bolts. The battery is easily removable.

THE WHEELS are the malleable steel type with six spokes, both front and rear. The spokes are hollow and the wheels very strong, although they are but very little heavier than ordinary wood wheels.

THE TIRES are 6.50"-20" base, balloons standard equipment, 30 x 5 high pressure tires are optional at no extra cost.

Dual rear wheels equipped with either of the above tires are available at additional cost.

GASOLINE TANK is located under the driver's seat. The capacity is 15 gallons. The tank is constructed of No. 20 gauge terne plate. The header plates are stamped in a dished section and fastened in place by a lapped and rolled seam which is also soldered. Stewart vacuum system is used.

HEADLIGHTS are the new type having controllable beam. The large bulb has double filaments and produces the high or long distance light for country work on the lower filament, while the upper filament produces a short flood light for city driving. An additional bulb with single filament furnishes parking lights.

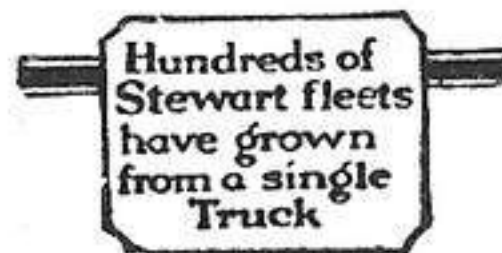
The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell finish is baked black enamel and the rim finish is chromium plate.

The lens comply with all state requirements.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing points and a high pressure Alemite grease gun furnished with each truck as standard equipment.

PAINT: All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.



MODELS 16A - 16XA—1 1/4 TON**Specifications**

- Rated Capacity - - 2500 pounds.
- Wheel Base - - - - Standard; 136", 145" and 160" Special.
- Track - - - - - Front 59". Rear $62\frac{5}{16}$ " for Singles, $64\frac{3}{4}$ " for duals.
- Tire Equipment - - 32"x6" all around, 8 ply Standard. 10 ply extra cost. Dual rears at extra cost.
- Chassis Weight - - 3596 lbs. four and six cylinder, Standard wheelbase 145".
- Body Length - - - From 8 ft. to 12 ft., depending on wheel base.
- Engine - - - - - **Model 16**—Four cylinder, size $3\frac{3}{4}$ "x5".
 Piston displacement 221 cu. in.
 Horse Power 22.5 S.A.E. Actual 42 H.P. at 2200 R.P.M.
 Maximum torque 132 ft. pounds.
 Cooling—Thermo syphon.
 Carburetor—Stromberg. S.A.E. 1" flange.
- Model 16X**—Six cylinder, size $3\frac{1}{4}$ "x4 1/2".
 Piston displacement 224 cu. in.
 Horse Power 25.4 S.A.E. Actual 61 H.P. at 2600 R.P.M.
 Maximum torque 142 foot pounds.
 Cooling—Centrifugal water pump.
 Carburetor—Stromberg. S. A. E. $1\frac{1}{4}$ " flange.
- Rear Axle Ratio - - 5.6-1 bevel gears, Standard.
 6.37-1 bevel gears, Special.

- Transmission Ratio Standard Four Speed. Ratios: Low, 6.4-1; second, 3.09-1; third, 1.69-1; high, 1-1; reverse, 7.82-1.
- Turning Radius - - 25 feet.
- Brakes - - - - - Foot brakes, Bendix Duo-Servo four wheel, mechanical. Size, front 14" x 2"; rear 16" x 2". Hand brake on transmission. Size 8" diameter by 2 1/2" wide.
- Gasoline Tank - - Located under seat, capacity 15 gallons, Stewart Vacuum System with booster.
- Frame - - - - - Depth 6", width 2 1/4", steel $\frac{3}{16}$ " thick on 145" wheelbase frame.
- Front Springs - - - 38 1/2" long, 2 1/4" wide, nine leaves.
- Rear Springs - - - Size, 50" long, 2 1/2" wide, 11 leaves. Special underslung spring, 60" long and 2 1/2" wide for easy riding can be furnished at extra cost. Helper springs can be furnished at extra cost on regular overhung springs.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric horn and battery; vacuum tank with booster and gas filter; tool kit, jack, rear tire carrier, spare rim, speedometer, windshield wiper and mirror on all bodies and cabs, carburetor air cleaner, thermostat, stop light, and Alemite grease gun. The instrument board is equipped with ammeter, oil gauge, starting choke button, lighting and ignition switches and indirect dash light.

Model 16 and Model 16X, Mechanical Description

MODEL 16 MOTOR—4 CYLINDER: This motor has four cylinders cast enbloc, vertical "L" head type, with detachable cylinder head and detachable block. The bore is 3 3/4"x5" stroke, having large water spaces for a Thermo Syphon cooling system. The base is designed

for a three point suspension in the frame. The cylinders and crank case are made of gray cast iron. The case is heavily ribbed to prevent distortion and has five crank shaft bearing supports. The lower half of the crankcase or oil pan is made of pressed steel and is easily removable, allowing complete access to all crank shaft and rod bearings, oil pump and the complete oiling system of the motor. The bell housing which encloses the flywheel is so constructed that the flywheel may be removed by simply taking off the lower half of the bell housing and removing the bolts which hold the flywheel to the crankshaft. The starting crank is of the removable type. The starting crank opening is covered with an aluminum cap when the starting crank is not in place. The motor timing gears are located at the front end of the motor. They are helical spur gears and are 1" wide.

THE OILING SYSTEM of the motor is the force feed, pressure type. Oil pressure is maintained by means of a gear pump which is located about the centre of the engine and driven from the cam shaft by means of spiral gears. An adjustable oil pressure relief valve is provided and this is connected with the foot accelerator. The oil is pumped from the base to the oil distributing tube which is cast into the crank case and then flows thru holes drilled in the crank case webs directly to the crank shaft and cam shaft bearings. Oil holes drilled in the crank shaft lead the oil to the lower connecting rod bearings. The oil pressure varies from 15 pounds at idling speeds to about 50 pounds at high speed. With this system of connecting up the pressure regulation with the carburetor throttle, the volume of oil is low when the motor is not working hard and rises to full volume as the throttle is opened wide.

THE CRANKSHAFT is rather unusual for a four cylinder motor, as it has five main crank shaft bearings. The shaft is dropped forged from .40-.50 open hearth carbon steel, double heat treated, machined, ground and then given a thorough test on a specially designed balancing machine. This kind of design produces a motor which

is unusually durable and rugged. The five crank shaft bearings align the shaft in a very rigid position, prevent excessive vibration and produce long life. All crank shaft bearings are bronze backed.

Size of front	crank shaft bearing,	$2\frac{1}{8}'' \times 2\frac{11}{16}''$
" " second	" " "	$2\frac{1}{8}'' \times 1\frac{3}{8}''$
" " third	" " "	$2\frac{1}{8}'' \times 1\frac{13}{16}''$
" " fourth	" " "	$2\frac{1}{8}'' \times 1\frac{3}{8}''$
" " rear	" " "	$2\frac{1}{8}'' \times 2\frac{11}{16}''$

THE CAM SHAFT is machined from a drop forging, heat treated and ground. All cams are integral with the shaft. The shaft is $1\frac{1}{8}''$ in diameter and has four bearings.

Size of front	cam shaft bearing	$2.04 \times 2\frac{1}{8}''$
" " second	" " "	$2'' \times \frac{7}{8}''$
" " third	" " "	$1.97 \times \frac{7}{8}''$
" " rear	" " "	$1.94 \times 2''$

THE CONNECTING RODS are "I" beam section of open hearth steel, drop forged, heat treated, machined and ground. The rods are $11\frac{15}{16}''$ long. All connecting rod bolts for holding on the caps are nickel steel. The lower end of the rod is provided with a bronze backed babbitt bearing and the upper end is bronze bushed. All connecting rods are carefully balanced.

THE VALVES are located on the right hand side of the motor and are all enclosed by means of a removable pressed steel plate. All exhaust valves are made of Silchrome steel and all inlet valves are carbon steel. The effective working diameter of both inlet and exhaust valves is $1\frac{5}{8}''$. The lift of all valves is $\frac{5}{16}''$. Angle of seat 45° . The valve stems are hardened and are lubricated by means of splash from the motor base. The valve stems and push rods work in separate removable bushings. The valve lifters are mushroom type.

THE RADIATOR FAN has four pressed steel blades, 16" in diameter. The rotation looking at the front end of the motor is clockwise. The drive pulley is 3 7/8" diameter and made for a V belt, 5/8" wide with 38 degree included angle. The pulley on the fan is 3 1/4" diameter. The fan has a vertical adjustment for taking up slack in the fan belt.

THE FLYWHEEL is made of a special mixture of cast iron. Teeth are cut in the outside rim for the starter gear. The flywheel is carefully balanced at all speeds to insure against vibration.

THE PISTONS are made of a mixture of fine gray cast iron. After being machined, they are ground to limits of one half thousandth. Special care is taken in boring and reaming the piston to insure a perfect fit and alignment. The piston is 3 3/4" diameter and 4 1/8" long. There are four piston rings, each 1/8" wide. All pistons are carefully weighed and held to close limits to avoid the possibility of vibration. The piston pins are 1 1/8" in diameter, hardened and ground to size. The pin is clamped in the connecting rod and floats in the piston bosses.

THE SPARK PLUGS are located in the top of the cylinder head. They are 7/8-18 U.S.F. thread.

THE LIGHTING GENERATOR is of the 6 volt type, with third brush adjustment for output. The generator is bolted directly to the crank case at the forward right hand side by means of a standard S.A.E. flange. It is driven directly by the motor timing gears.

THE DISTRIBUTOR is located at the right hand side of the motor at the front and is driven off the cam shaft by means of a set of spiral gears. Looking down on top of the distributor, it rotates clockwise.

THE STARTING MOTOR is located on the left hand side at the rear. It is attached to the motor by means of Standard S.A.E. flange on the flywheel housing. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

STANDARD IGNITION is by battery and distributor. However, magneto ignition can be furnished on special order.

MODEL 16X MOTOR—SIX CYLINDER

This motor has six cylinders, cast enbloc, vertical "L" head type, with detachable cylinder block and detachable cylinder head. The cylinders are made of a special close grained, gray iron. There are large water spaces around the cylinders and valves and over the combustion chambers.

The motor size is 3 1/4" bore by 4 1/2" stroke and actually develops 61 H.P. at 2600 R.P.M. The motor is designed for three point suspension, the two rear motor arms resting on solid rubber pads.

The crank case is made of cast iron and is strongly ribbed to prevent distortion at any point. Four heavy ribs are cast in the base to support the four crank shaft bearings. The crank case is machined for standard No. 3 S.A.E. transmission mounting.

The oil pan is made of pressed steel with the oil pump located in the centre of the pan. The pan is easily removable, which allows complete access to all crank shaft and rod bearings and to the oil pump.

The intake and exhaust manifolds are of the Swan type with a hot spot to assist in vaporizing the fuel.

The crank shaft is so designed that the pistons can be drawn down past the crank throws to get them out without the necessity of removing the cylinder head.

The bell housing, which encloses the flywheel, is so constructed that the lower half may be removed.

THE OILING SYSTEM is a full force feed, pressure system. Pressure is maintained by means of a submerged

gear pump located in the centre of the motor base. The pump is driven by means of a set of spiral gears from the cam shaft. The crank shaft is hollow drilled to distribute oil to the main bearings.

The oil pressure is controlled by a regulator valve to give constant pressure at all engine speeds.

Pistons and cylinders are lubricated by oil thrown from the upper and lower ends of the connecting rods. Timing gears are fed positively from the oiling system.

THE CRANKSHAFT has four main bearings and is $2\frac{3}{8}$ " diameter. It is dropped forged from .40-.50 open hearth steel, double heat treated, machined, ground to size, hollow drilled for oil feeds and then balanced on a special crankshaft balancing machine at high speeds. The main crankshaft bearings are as follows:

Size of front	crank shaft bearing,	$2\frac{3}{8}" \times 2\frac{1}{16}"$
" " second	" " "	$2\frac{3}{8}" \times 1\frac{3}{4}"$
" " third	" " "	$2\frac{3}{8}" \times 2"$
" " rear	" " "	$2\frac{3}{8}" \times 2\frac{3}{8}"$

The rear end of the crankshaft forging has a heavy flange to which the flywheel is bolted. All main bearings are bronze backed and babbit lined.

THE CAM SHAFT is drop forged from .20 carbon steel. All cams and bearings are forged integral, heat treated, machined and ground to size. All cams are tested with the scleroscope for a required degree of hardness. The cam shaft is $1\frac{1}{8}"$ diameter and is supported on five bearings.

Size of front	cam shaft bearing,	$2" \times 1\frac{7}{8}"$
" " second	" " "	$2" \times 1"$
" " third	" " "	$2" \times 1\frac{1}{16}"$
" " fourth	" " "	$2" \times 1\frac{1}{16}"$
" " rear	" " "	$2" \times 1\frac{1}{2}"$

THE CONNECTING RODS are dropped forged from .30-.40 open hearth carbon steel. They have the "I" beam section and are double heat treated. They are

9" long from centre to centre. The large connecting rod bearings are pressure cast directly into the large end of the connecting rod by a centrifugal process which ensures the proper density of the metal. The upper connecting rod ends are bushed with bronze. The lower connecting rod bearings are $2\frac{1}{8}" \times 1\frac{1}{2}"$. The upper bronze bushings are $\frac{7}{8}" \times 1\frac{7}{16}"$.

THE VALVES are entirely enclosed and the valve chamber is flooded with oil from the motor base. There are two valve cover plates, made of pressed steel. When these plates are removed, the valves are easy to reach for adjustment.

The exhaust valves are made of Silchrome steel especially designed to resist the high temperature of the exhaust gases. The inlet valves are made of nickel steel. The exhaust valves are $1\frac{15}{32}"$ diameter and the inlet valves $1\frac{5}{8}"$ diameter. All valves have a lift of $\frac{5}{16}"$. Inlet valves have a seat angle of 30° and exhaust valves have 45° .

The valve lifters are the standard mushroom type carefully hardened and ground. They are flooded with oil from the crank case. Screwed into the stem of the valve lifter is an adjusting screw with a special hardened head, held in position with a lock nut. The valves are adjusted by means of this screw.

THE WATER PUMP is located on the right hand side of the motor, just back of the centre of the cylinder block. The pump is the conventional centrifugal pump. It is attached to the side of the cylinder block for support and is driven by means of a flexible hose coupling from the rear of the generator shaft.

THE RADIATOR FAN has four pressed steel blades. It is located on a vertical, adjustable bracket on the front end of the cylinder block. It is driven by a V type fan belt which is $\frac{3}{4}"$ wide across the top. The included angle of the fan belt is 38° . The lower pulley, located on the crank shaft, is $5\frac{1}{4}"$ diameter and the fan pulley is 4" diameter.

THE FLYWHEEL is attached to the crankshaft with six bolts. These are dimensioned bolts and the holes are reamed to size. The flywheel is made of cast iron and a steel ring gear with teeth for the starter is pressed on. The flywheel is machined for multiple disc, dry plate clutch and is carefully balanced to prevent vibration.

THE PISTONS are made of a special fine gray cast iron. They are 3 1/4" diameter and 4" long. They have four piston rings at the top of the piston. The three top rings are plain cast iron 1/8" wide. The lower ring is a special oil wiper ring 3/16" wide. All pistons are weighed and held within close limits. The piston pins are 7/8" diameter. They are made from open hearth steel, heat treated and ground to size.

THE SPARK PLUGS are located in the top of the cylinder head. They are 7/8"—18 U.S.F. thread.

THE LIGHTING GENERATOR is a Delco-Remy Unit, delivering a six volt current and has the third brush regulation for current output. It is located on the right hand side of the motor and is attached to the rear side of the timing gear case by means of Standard S.A.E. flange. The generator is driven by the timing gears at 1 1/4 times motor speed. Rotation looking at the driving end of the generator is clockwise.

THE DISTRIBUTOR is mounted on top of the cylinder head about the centre of the block. It is driven from the camshaft by means of a set of spiral cut gears. Looking down on the top of the distributor, the rotation is clockwise.

THE STARTING MOTOR is mounted on the right hand side of the motor at the rear. It is attached to the front face of the flywheel housing by S.A.E. standard flange. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

THE STANDARD IGNITION is by battery, but a magneto unit can be furnished on special order.

THE TRANSMISSION is of the unit power plant type which bolts directly to the flywheel housing of the motor. The control set which consists of the gear shift lever and hand brake lever are mounted on the cover plate of the transmission. The transmission case is made of cast iron.

The gears are 7 pitch and 7-9 pitch and their width varies from $\frac{5}{8}$ " to $1\frac{1}{16}$ " according to the loads they carry. They are made from high grade alloy steel and are heat treated to give maximum strength.

The main shaft is $1\frac{1}{2}$ " in diameter and is supported on annular ball bearings. The front bearing is No. 1209 and the rear bearing is No. 1307. The main shaft has six heavy splines which drive the gears.

The countershaft gears are forged in one piece of high grade alloy steel specially heat treated to give maximum strength. This gear unit is mounted on two long roller bearings which in turn run on a 1" shaft which is locked to the transmission case. The part number of the roller bearing is WS7640. The transmission has an opening for power take off or tire pump.

The gear ratios are as follows:

Low—6.40-1	Third—1.69-1	Reverse—7.82-1
Second—3.09-1	Fourth—1.00-1	

The rear axle ratio is 5.6-1. Therefore, the total gear reductions from motor to rear axle are as follows: Low, 35.8-1; Second, 17.3-1; Third, 9.46-1; High, 5.6-1; Reverse, 43.7-1.

The special rear axle gear ratio is 6.37-1. Therefore, the total reductions with this axle are as follows: Low, 40.7:1; Second 19.7-1; Third, 10.8-1; High, 6.37-1; Reverse, 49.7-1.

THE CLUTCH is a single plate type, Borg and Beck. It is easily adjustable for wear, and has a very smooth action. The clutch plate is 11" diameter. It has a vibration dampener, which eliminates noise. The facings are molded giving extra long life.

THE FRONT AXLE is of the reverse, Elliott type with dropped forged, heat treated steel "I" beam, 1 5/8" wide 2 1/4" deep. The nickel steel spindles for the wheels are 1 1/2" diameter at the inside bearing and 7/8" diameter at the outside bearing. The steering ball on the arm is 1 1/8" diameter. The steering cross tube is 1 1/8" diameter, seamless steel tubing and is equipped with special design, ball and socket joints, which prevent cramping. The spindle and wheel bearings are the latest type Timken roller bearings. The tread is 59". The steering arms, both sides, are forged from nickel steel and heat treated.

REAR AXLE is of the full floating spiral bevel gear construction. The axle housing is cast steel of the banjo type. The rear axle cover plate is a pressed steel part.

The ring gear is made of 3 1/2% nickel steel and the pinion is made of 5% nickel steel and the teeth are carefully carbonized and hardened. The tooth face is 1 5/16" wide. The standard gear ratio is 5.6-1; Special ratio 6.37-1.

The differential is of the four pinion type and is mounted on two Timken roller bearings No. 377-3720. These bearings are easily adjustable after the rear axle cover plate has been removed.

The spiral bevel pinion is straddle mounted on annular ball bearings. The front pinion bearing is a double row No. 308 and the rear a No. 1306 single row bearing. The pinion shaft end is finished standard 1 3/8" S.A.E. taper.

The full floating axle drive shafts are made of high carbon, nickel steel. They are 1 1/2" in diameter full length except the differential and hub ends are enlarged where the splines are cut.

The wheel bearings are mounted on a seamless steel tube reinforcing sleeve 2 1/4" in diameter which extends for some distance into the axle housing. There are two Timken wheel bearings on each wheel, No. 387-382.

THE DRIVE SHAFT is made of high carbon seamless steel tubing 2" in diameter on 145" wheelbase. This tubing is carefully selected and tested for true running balance at high speeds. The tube walls are 3/32" thick and uniform.

The Spicer universal joints are tightly enclosed in pressed steel cases which retain the lubricant and keep out the dirt. The cases are provided with adjustable locks to hold them tightly in position. The yokes of the joints are made of molybdenum steel, heat treated and ground to size. All pins and bushings are also of steel and are hardened and ground to accurate dimensions so that all parts are interchangeable.

THE FOOT BRAKES are the Bendix Duo-Servo four wheel brakes. They are the self-energizing type brake which has a very powerful action without requiring excessive foot pressure. They are all internal expanding and are entirely enclosed, both front and rear, and are mechanically operated by the foot pedal. The braking effort is so distributed that 65% goes to the rear wheels and 35% to the front. The rear brakes are 16" x 2" and the front 14" x 2".

THE HAND BRAKE is located at the rear end of the transmission. The brake band is supported by a heavy bracket attached to the end of the transmission case. The brake drum is securely riveted to the universal joint flange. The brake is of the external contracting band type. It is 8" in diameter and 2 1/2" wide. The brake lining is $\frac{3}{16}$ " thick and will wear for a long time. A thumb nut adjustment provides means for tightening up the band as the lining wears down. The hand brake should be used only for parking purposes and in an emergency. The foot pedal, which operates the Bendix brakes, on all four wheels, should be used for all ordinary braking purposes.

STEERING GEAR is the Ross cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is 1 1/2" diameter, is made of seamless steel tubing and finished with baked black enamel. The steering wheel is 17" diameter. The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is 1 1/8" diameter, hardened and ground to size. A large horn button is mounted in the center of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

THE SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated.

The front springs are 38 1/2" long by 2 1/4" wide. The rear springs are 50" long by 2 1/2" wide. All front spring pins are 3/4" diameter and 1" diameter on the rear springs.

THE FRAME side rails are 6" deep. The upper and lower flanges are 2 1/4" wide. The thickness of the steel is $\frac{3}{16}$ ". The width of the frame is 32".

The frames are made from .20-.25 open hearth, carbon steel. The cross members with integral gussets are hot riveted in place.

THE RADIATOR is pressed steel, shell type, chrome plated. The upper and lower tanks and core are made up in one unit. The core is the cellular type. It is suspended in the radiator shell by means of side supports bolted to the shell. The radiator has a frontal area of 400 square inches. The core is 2 3/4" thick. The water capacity of the radiator and motor is approximately 5 1/2 gallons.

THE THERMOSTAT regulates the temperature of the water in the motor. It is inserted in the water manifold on top of the cylinder head between the motor and the radiator. When the water is cold the thermostat valve is closed. This cuts off the water circulation until the water in the motor becomes hot at which time the thermostat valve commences to open and again allows water circulation. At about 175 degrees temperature the valve is full open in which position it will stay until the water again commences to cool off when it will automatically close.

THE STORAGE BATTERY is a six volt, 106 ampere hour capacity. It has a molded hard rubber case and is mounted in a suitable bracket attached to the inside of the frame side rail. The battery is held by means of two clamp bolts, in such a way that no strain is put on the case. The battery is easily removable.

THE WHEELS are the malleable steel type with six spokes, both front and rear. The spokes are hollow and the wheels very strong, although they are but very little heavier than ordinary wood wheels.

THE TIRES are 32"x6" High Pressure, 8 ply. High pressure, 10 ply can be furnished at extra cost. Fire-stone rims.

GASOLINE TANK is located under the driver's seat. The capacity is 15 gallons. The tank is constructed of No. 20 gauge terne plate. The header plates are stamped in a dished section and fastened in place by a lapped and rolled seam which is also soldered. Stewart vacuum system is used.

HEADLIGHTS are the new type having controllable beam. The large bulb has double filaments and produces the high or long distance light for country work on the lower filament while the upper filament produces a short flood light for city driving. An additional bulb with single filament furnishes parking lights.

The headlights are mounted on S.A.E. adjustable brackets for focusing purposes. The shell and rim are chrome finish. The lens comply with all state requirements.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing points and a high pressure Alemite grease gun furnished with each truck as standard equipment.

PAINT. All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red .

MODEL 28 & 28X—1½ TON

Specifications

- Rated Capacity - - 3000 pounds.
- Wheelbase - - - - Standard 136", Special 145", 160" and 176".
- Track - - - - - Front 59"; rear, with single tires, 60³/₈"; rear, with dual tires, 63⁵/₈".
- Tire Equipment - - Standard front 30"x5" pneumatic; rear 30"x5" dual pneumatic, 6-ply. Special price 32"x6" all around single rear 10 ply. Special price front 32"x6" pneumatic; rear 34"x7" single pneumatic. Solid, front 34"x4"; solid, rear 34"x6" at special price.
- Chassis Weight - - 3958 for 136" wheelbase.
- Body Length - - - From 10 ft. to 13 ft., depending on wheelbase.
- Engine - - - - - Model 28X—Six cylinders, size 3¼"x4½". Piston displacement 224 cu. in. Horse Power, 25.4, S.A.E. Actual 61 H.P. at 2600 R.P.M.
- Maximum torque 142 foot pounds. Cooling, centrifugal pump. Carburetor. Stromberg. S.A.E. 1¼" flange.
- MODEL 28—Four cylinders, size 4"x5". Piston displacement 251.3 cu. in. Horse Power 25.6 S.A.E. Actual 44 H.P. at 2000 R.P.M. Maximum Torque 149 foot pounds Cooling—Centrifugal Pump.
- Carburetor—Stromberg, S.A.E. 1".

Rear Axle Ratio - 6.37-1 bevel gear, Standard 7.28-1. Special bevel gear at extra cost.

Transmission - - - Standard Four Speed.

Transmission Ratios Low, 6.5-1; Second, 3.91-1; Third, 2.06-1; High, 1-1; Reverse, 8.1-1.

Turning Radius - - 25 feet.

Brakes - - - - - Foot brakes, Bendix Duo-Servo four wheel, mechanical. Size, front 14"x2"; rear 16"x2½". Hand brake on transmission, size 8½" diameter by 4" wide.

Gasoline Tank - - Located on side of frame. Capacity 20 gallons. Stewart Vacuum System with booster. Gasoline gauge.

Frame - - - - - Depth on 136" wheelbase is 6". Depth 7½"; width 2¾"; steel 7/32" thick, 145", 160" and 176" wheelbase.

Front Springs - - - Size, 38½" long, 2¼" wide, ten leaves.

Rear Springs - - - Size 50" long, 2½" wide, 13 leaves in the main springs and 6 leaves in the helper. Special underslung springs, 60" long and 2½" wide for easy riding, can be furnished at extra cost. Helper springs are furnished Standard on regular overhung springs.

Radius Rods - - - Standard equipment on all chassis with standard overhung springs with helpers. Not furnished on underslung springs.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric horn and battery; vacuum tank with booster and gas filter; tool kit, jack, rear tire carrier, spare rim, speedometer, windshield

wiper and mirror on all bodies and cabs. Carburetor air cleaner, thermostat, gasoline gauge, stop light, and Alemite grease gun. The instrument board is equipped with ammeter, oil gauge, starting choke button, lighting and ignition switches and indirect dash light.

Model 28 and Model 28X—Mechanical Description

MODEL 28 ENGINE—4 CYLINDER: This engine has four cylinders cast enbloc, vertical "L" head type with detachable cylinder head and detachable block. The bore is 4"x5" stroke, having large water spaces and centrifugal pump cooling system. The base is designed for a three point suspension in the frame. The cylinders and crank case are made of gray cast iron. The case is heavily ribbed to prevent distortion and has five crank shaft bearing supports. The lower half of the crankcase or oil pan is made of pressed steel and is easily removable, allowing complete access to all crank shaft and rod bearings, oil pump and the complete oiling system of the motor. The bell housing, which encloses the flywheel, is so constructed that the flywheel may be removed by simply taking off the lower half of the bell housing and removing the bolts which hold the flywheel to the crank shaft.

The starting crank is of the removable type. The starting crank shaft opening is covered with an aluminum cap when the starting crank is not in place. The motor timing gears are located at the front end of the motor. They are helical spur gears and are 1" wide.

THE OILING SYSTEM of the motor is the forced feed, pressure type. Oil pressure is maintained by means of a gear pump which is located about the centre of the engine and driven from the cam shaft by means of spiral gears. An adjustable oil pressure relief valve is provided and this is connected with the foot accelerator. The oil is pumped from the base to the oil distributing tube which is cast into the crank case and then flows thru holes drilled in the crank case webs directly to the crankshaft and cam shaft bearings. Oil holes drilled in

the crank shaft lead the oil to the lower connecting rod bearings. The oil pressure varies from 15 pounds at idling speeds to about 60 pounds at high speed. With this system of connecting up the pressure regulator with the carburetor throttle, the volume of oil is low when the motor is not working hard and rises to full volume as the throttle is opened wide.

THE CRANKSHAFT is rather unusual for a four cylinder motor, as it has five main crank shaft bearings. The shaft is drop forged from .40-.50 open hearth carbon steel, double heat treated, machined, ground and then given a thorough test on a specially designed balancing machine. This kind of design produces a motor which is unusually durable and rugged. The five crank shaft bearings align the shaft in a very rigid position, prevent excessive vibration and produces long life. All crank shaft bearings are bronze backed.

Size of front	crank shaft bearing,	$2\frac{1}{8}'' \times 2\frac{11}{16}''$
" " second	" " "	$2\frac{1}{8}'' \times 1\frac{3}{8}''$
" " third	" " "	$2\frac{1}{8}'' \times 1\frac{13}{16}''$
" " fourth	" " "	$2\frac{1}{8}'' \times 1\frac{3}{8}''$
" " rear	" " "	$2\frac{1}{8}'' \times 2\frac{11}{16}''$

THE CAM SHAFT is machined from a drop forging, heat treated and ground. All cams are integral with the shaft. The shaft is $1\frac{1}{8}''$ in diameter and has four bearings.

Size of front	cam shaft bearing,	$2.04'' \times 2\frac{1}{8}''$
" " second	" " "	$2'' \times \frac{7}{8}''$
" " third	" " "	$1.97'' \times \frac{7}{8}''$
" " rear	" " "	$1.94'' \times 2''$

THE CONNECTING RODS are "I" beam section of open hearth steel, drop forged, heat treated, machined and ground. The rods are $11\frac{15}{16}''$ long. All connecting rod bolts for holding on the caps are nickel steel. The lower end of the rod is provided with a bronze backed, babbitt bearing and the upper end is bronze bushed. All connecting rods are carefully balanced.

THE VALVES are located on the right hand side of the motor and are all enclosed by means of a removable pressed steel plate. All exhaust valves are made of Silchrome steel and all inlet valves are carbon steel. The effective working diameter of both inlet and exhaust valves is $1\frac{5}{8}$ ". The lift of all valves is $\frac{5}{16}$ ". Angle of seat 45° . The valve stems are hardened and are lubricated by means of splash from the motor base. The valve stems and push rods work in separate removable bushings. The valve lifters are mushroom type.

THE RADIATOR FAN has four pressed steel blades 16" in diameter. The rotation looking at the front end of the motor is clockwise. The drive pulley is $3\frac{7}{8}$ " diameter and made for a "V" belt, $\frac{5}{8}$ " wide with 38 degree included angle. The pulley on the fan is $3\frac{1}{4}$ " diameter. The fan has a vertical adjustment for taking up slack in the fan belt.

THE FLYWHEEL is made of a special mixture of cast iron. Teeth are cut in the outside rim for the starter gear. The flywheel is carefully balanced at all speeds to insure against vibration.

THE PISTONS are made of aluminum alloy. After being machined, they are ground to limits of one-half thousandth. Special care is taken in boring and reaming the piston pin holes to insure a perfect fit and alignment. The piston is 4" diameter and $4\frac{7}{8}$ " long. There are three piston rings, each $\frac{3}{16}$ " wide. The two upper rings are plain and the lower is a special oil ring. Below the lower ring an oil groove is cut in the piston with holes drilled thru to the inside. All pistons are carefully weighed and held to close limits to avoid the possibility of vibration. The piston pins are $1\frac{1}{8}$ " in diameter, hardened and ground to size. The pin is clamped in the connecting rod and floats in the piston bosses.

THE SPARK PLUGS are located in the top of the cylinder head. They are $\frac{7}{8}$ "—18 U.S.F. thread.

THE LIGHTING GENERATOR is of the 6 volt type with third brush adjustment for output. The generator is bolted directly to the crank case at the forward right hand side by means of a standard S.A.E. flange. It is driven directly by the motor timing gears.

THE DISTRIBUTOR is located at the right hand side of the motor at the front and is driven off the cam shaft by means of a set of spiral gears. Looking down on top of the distributor, it rotates clockwise.

THE STARTING MOTOR is located on the left hand side at the rear. It is attached to the motor by means of Standard S.A.E. flange on the flywheel housing. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

STANDARD IGNITION is by battery and distributor. However, magneto ignition can be furnished on special order.

MODEL 28X MOTOR—6 CYLINDER: This motor has six cylinders, cast enbloc, vertical "L" head type, with detachable cylinder block and detachable head. The cylinders are made of a special close grained, gray iron. There are large water spaces around the cylinders and valves and over the combustion chambers.

The motor size is 3 1/4" bore by 4 1/2" stroke and actually develops 61 H. P. at 2600 R.P.M. The motor is designed for three point suspension, the two rear motor arms resting on solid rubber pads.

The crank case is made of cast iron and is strongly ribbed to prevent distortion at any point. Four heavy ribs are cast in the base to support the four crank shaft bearings. The crank case is machined for standard No. 3 S.A.E. transmission mounting.

The oil pan is made of pressed steel with the oil pump located in the centre of the pan. The pan is easily removable, which allows complete access to all crank shaft and rod bearings and to the oil pump.

The intake and exhaust manifolds are of the Swan type with a hot spot to assist in vaporizing the fuel.

The crank shaft is so designed that the pistons can be drawn down past the crank throws to get them out without the necessity of removing the cylinder head.

The bell housing, which encloses the flywheel, is so constructed that the lower half may be removed.

THE OILING SYSTEM is a full force feed, pressure system. Pressure is maintained by means of a submerged gear pump located in the centre of the motor base. The pump is driven by means of a set of spiral gears from the cam shaft. The crank shaft is hollow drilled to distribute oil to the main bearings.

The oil pressure is controlled by a regulator valve to give constant pressure at all engine speeds.

Piston and cylinders are lubricated by oil thrown from the upper and lower ends of the connecting rods. Timing gears are fed positively from the oiling system.

THE CRANKSHAFT has four main bearings and is $2\frac{3}{8}$ " diameter. It is dropped forged from .40-.50 open hearth steel, double heat treated, machined, ground to size, hollow drilled for oil feeds and then balanced on a special crank shaft balancing machine at high speeds.

The main crank shaft bearings are as follows:

Size of front	crank shaft bearing,	$2\frac{3}{8}" \times 2\frac{1}{8}"$
" " second	" " "	$2\frac{3}{8}" \times 1\frac{3}{4}"$
" " third	" " "	$2\frac{3}{8}" \times 2"$
" " rear	" " "	$2\frac{3}{8}" \times 2\frac{3}{8}"$

The rear end of the crankshaft forging has a heavy flange to which the flywheel is bolted. All main bearings are bronze backed and babbitt lined.

THE CAM SHAFT is drop forged from .20 carbon open hearth steel. All cams and bearings are forged integral, heat treated, machined and ground to size. All cams are tested with the scleroscope for a required degree

of hardness. The cam shaft is 1⅛" diameter and is supported on five bearings.

Size of front	cam shaft bearing,	2"x1⅞"
" " second	" " "	2"x1"
" " third	" " "	2"x1⅙"
" " fourth	" " "	2"x1⅙"
" " rear	" " "	2"x1½"

THE CONNECTING RODS are drop forged from .30-.40 open hearth, carbon steel. They have the "I" beam section and are double heat treated. They are 9" long from centre to centre. The large connecting rod bearings are pressure cast directly into the large end of the connecting rod, by a centrifugal process which ensures the proper density of the metal. The upper connecting rod ends are bushed with bronze. The lower connecting rod bearings are 2⅛"x1½". The upper bronze bushings are ⅞"x1⅙".

THE VALVES are entirely enclosed and the valve chamber is flooded with oil from the motor base. There are two valve cover plates, made of pressed steel. When these plates are removed, the valves are easy to reach for adjustment.

The exhaust valves are made of Silchrome steel, especially designed to resist the high temperature of the exhaust gases. The inlet valves are made of nickel steel. The exhaust valves are 1 15/32" diameter and the inlet valves 1⅝" diameter. All valves have a lift of ⅝". Inlet valves have a seat angle of 30° and exhaust have 45°.

The valve lifters are the standard mushroom type carefully hardened and ground. They are flooded with oil from the crank case. Screwed into the stem of the valve lifter is an adjusting screw with a special hardened head, held in position with a lock nut. The valves are adjusted by means of this screw.

THE WATER PUMP is located on the right hand side of the motor, just back of the centre of the cylinder

block. The pump is the conventional centrifugal type. It is attached to the side of the cylinder block for support and is driven by means of a flexible hose coupling from the rear of the generator shaft.

THE RADIATOR FAN has four pressed steel blades. It is located on a vertical adjustable bracket on the front end of the cylinder block. It is driven by a "V" type fan belt, which is $\frac{3}{4}$ " wide across the top. The included angle of the fan belt is 38° . The lower pulley, located on the crank shaft is $5\frac{1}{4}$ " diameter and the fan pulley is 4" diameter.

THE FLYWHEEL is attached to the crank case flange with six bolts. These are dimensioned bolts and the holes are reamed to size. The flywheel is made of cast iron and a steel ring gear with teeth for the starter is pressed on. The flywheel is machined for multiple disc dry plate clutch and is carefully balanced to prevent vibration.

THE PISTONS are made of a special fine cast gray iron. They are $3\frac{1}{4}$ " diameter and 4" long. They have four piston rings at the top of the piston. The three top rings are plain cast iron $\frac{1}{8}$ " wide. The lower ring is a special oil wiper ring $\frac{3}{16}$ " wide. All pistons are weighed and held within close limits. The piston pins are $\frac{7}{8}$ " diameter. They are made from open hearth steel, heat treated and ground to size.

THE SPARK PLUGS are located in the top of the cylinder head. They are $\frac{7}{8}$ "—18 U.S.F. thread.

THE LIGHTING GENERATOR is a Delco-Remy Unit, delivering a six volt current and has the third brush regulation for current output. It is located on the right hand side of the motor and is attached to the rear side of the timing gear case by means of Standard S.A.E. flange. The generator is driven by the timing gears at $1\frac{1}{4}$ times motor speed. Rotation looking at the driving end of the generator is clockwise.

THE DISTRIBUTOR is mounted on top of the cylinder head, about the centre of the block. It is driven from the cam shaft by means of a set of spiral cut gears. Looking down on the top of the distributor, the rotation is clockwise.

THE STARTING MOTOR is mounted on the right hand side of the motor at the rear. It is attached to the front face of the flywheel housing by S.A.E. standard flange. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

THE STANDARD IGNITION is by battery, but a magneto equipped unit can be furnished on special order.

THE TRANSMISSION is a 4 speed, unit power plant type which bolts directly to the flywheel housing of the motor. The transmission gears have a 3/4" width of face and are cut 5-7 and 6-8 pitch, which produces exceptionally strong teeth. After the gears are cut, they are first carbonized and then given a double heat treatment which produces maximum hardness on the gear tooth surface and maximum toughness inside. They are made from 3 1/2% nickel steel.

The main transmission shaft has ten large splines which drive the gears. These shafts are made of 3 1/2% nickel steel, carefully heat treated and ground to size.

Annular ball bearings are used on the main shaft and on the countershaft. The main shaft front bearing is No. 209. Main shaft rear bearing is No. 307. Both countershaft bearings are No. 305.

The transmission gear ratios are arranged as follows: Low, 6.5-1; Second, 3.91-1; Third, 2.06-1; High, 1-1; Reverse, 8.1-1.

The rear axle ratio is 6.37-1. Therefore, the total gear reductions from motor to rear axle are as follows: Low, 41.4-1; Second, 25-1; Third, 13-1; High, 6.37-1; Reverse 51.6-1.

The special rear axle gear ratio is 7.28-1. Therefore, the total reductions with this rear axle are as follows: Low, 47.3-1; Second, 28-1; Third, 15-1; High, 7.28-1; Reverse, 59-1.

THE CLUTCH is the dry plate, multiple disc type, which consists of one set of plain steel plates and another set of steel discs lined, on both sides, with asbestos fabric facings. The steel plates are $\frac{1}{16}$ " thick, made from saw blade steel and properly hardened. The outside edges of the asbestos covered clutch discs are cut with small gear teeth which fit with similar teeth cut in the inside face of the clutch driving drum. This method of construction provides large wearing surfaces and prevents noise. The clutch driving drum is bolted to the flywheel in such a way as to prevent the possibility of its becoming loose.

There are a total of 11 plates in the clutch, 6 double faced plates and five plain steel plates, together with the two header plates. The plates are all 8" outside diameter and 6" inside diameter, which gives a total clutch area of 264 square inches.

The clutch spring is made of a single coil of rectangular spring steel, calibrated to give the exact desired compression.

The clutch shaft is $1\frac{3}{8}$ " in diameter, made from $3\frac{1}{2}\%$ nickel steel, heat treated and ground to size. It is piloted into the flywheel with a No. 205 annular ball bearing which is provided with a grease retaining ring.

The clutch release trunnion is equipped with a specially designed ball-thrust bearing provided with a grease retaining ring. Both the pilot and clutch throw-out bearings have positive means of lubrication.

THE FRONT AXLE is the reverse Elliott type with dropped forged, heat treated steel "I" beam, $1\frac{5}{8}$ " wide by $2\frac{1}{4}$ " deep. The nickel steel spindles for the wheels are $1\frac{1}{2}$ " diameter at the inside bearing and $\frac{7}{8}$ " diameter at the outside bearing. The axle pivot bolt is $\frac{7}{8}$ " diameter, hardened and ground. The steering ball on the arm is $1\frac{1}{8}$ " diameter. The steering cross tube is

1½" diameter, seamless steel tubing and is equipped with special design ball and socket joints, which prevent cramping. The spindle and wheel bearings are the latest type Timken roller bearings. The tread is 59". The steering arms, both sides, are forged from nickel steel and heat treated.

THE REAR AXLE is the semi-floating, spiral bevel gear construction. The axle housing is made from electric furnace, cast steel. It is banjo shaped with square ends and is extremely rugged and stiff throughout.

The spiral bevel gear is made from 3½% nickel steel while the bevel pinion is made from 5% nickel steel. The differential is the four pinion type and large in size. The spiral bevel gears are cut 3.8 pitch and have a tooth face 1½" wide. The differential is mounted on two Timken bearings No. 397-394 which are readily adjustable after the rear axle cover has been removed. The spiral bevel pinion is straddle mounted on angular ball bearings. The front pinion bearing is a double row No. 5310 and the rear bearing is a single row No. 1306.

The axle drive shafts are made from chrome nickel steel and are heat treated for strength and toughness. The shafts are 2½" diameter at the wheel end and each shaft is mounted on two Timken roller bearings No. 478-472. These bearings are adjustable for wear. The shafts are splined at the differential end and are tapered and splined at the wheel end. In this kind of construction the tapered part keeps the wheel hub aligned in the proper position while the splines do the driving.

THE DRIVE SHAFT is made of high carbon, seamless steel tubing 2" in diameter. This tubing is carefully selected and tested for true running balance at high speeds. The tube walls are .109 thick and uniform.

The Spicer universal joints are tightly enclosed in pressed steel cases which retain the lubricant and keep out the dirt. The cases are provided with adjustable locks to hold them tightly in position. The yokes of the joints are made of molybdenum steel, heat treated and ground to size. All pins and bushings are also of steel and are

hardened and ground to accurate dimensions so that all parts are interchangeable. This drive shaft assembly has three joints with a centre support. This centre support consists of a malleable iron housing which holds SKF self-aligning ball bearings and is bolted to the centre cross member of the frame by means of a flat steel support.

THE FOOT BRAKES are the Bendix Duo-Servo four wheel brakes. They are the self energizing type brake which has a very powerful action without excessive foot power. They are all internal expanding and are entirely enclosed both front and rear and are mechanically operated by the foot pedal. The braking effort is so distributed that 65% goes to the rear wheels and 35% to the front. The rear brakes are 16 x 2½" and the front 14 x 2".

THE HAND BRAKE is located at the rear end of the transmission. The brake band is supported by a heavy bracket attached to the end of the transmission case. The brake drum is securely riveted to the universal joint flange. The brake is of the external contracting band type. It is 8½" in diameter and 4" wide. The brake lining is ¼" thick and will wear for a long time. A thumb nut adjustment provides means for tightening up the band as the lining wears down. The Hand Brake should be used only for parking purposes and in an emergency. The foot pedal which operates the Bendix Brakes on all four wheels should be used for all ordinary braking purposes.

THE STEERING GEAR is the Ross Cam and Lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is 1¾" diameter, is made of seamless steel tubing and baked black enameled. The steering wheel is 18" diameter and made up of laminated wood sections. The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is 1⅛"

diameter, hardened and ground to size. The spark and throttle controls and the horn button are mounted in the centre of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

THE FRAME is made of .20-.25 carbon, open hearth steel, carefully selected and tested. Samples showing excess phosphorus or sulphur content are rejected.

The side rails are tapered from front to rear and are 7 1/2" deep on 145", 160" and 176" wheelbase and 6" on 136" wheelbase at the centre section. The upper flange is 2 3/4" wide. The lower flange is 2 1/8" wide. The thickness of the steel in the side rails is 7/32". Three cross members with heavy gussets are hot riveted to the side rails. The overall width of the frame is 32". The length varies with the wheelbase.

THE SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated.

The front springs are 38 1/2" long by 2 1/4" wide. The rear springs are 50" long by 2 1/2" wide. Front spring pins are 3/4" diameter and 1 1/4" diameter on the rear spring. Helper springs are furnished Standard.

THE RADIATOR is a pressed steel, shell type, chrome plated. The upper and lower tanks and core are made up in one unit. The core is the cellulosic type. It is suspended in the radiator shell by means of side supports bolted to the shell. The radiator has a frontal area of 400 square inches. The core is 2 3/4" thick. The water capacity of the radiator and motor is approximately 5 1/2 gallons.

THE THERMOSTAT regulates the temperature of the water in the motor. It is inserted in the water manifold on top of the cylinder head between the motor and the radiator. When the water is cold the thermostat valve is closed. This cuts off the water circulation until the water in the motor becomes hot at which time the ther-

mostat valve commences to open and again allows water circulation. At about 175 degrees temperature the valve is full open in which position it will stay until the water again commences to cool off when it will automatically close.

THE STORAGE BATTERY is a six volt type, 106 ampere hour capacity. It has a molded hard rubber case and is mounted in a watertight box on the left hand running board. The battery is held down in such a way that no strain is put on the case. The battery is easily removable.

THE WHEELS are the malleable steel type with six spokes, both front and rear. The spokes are hollow and the wheels very strong although they are but very little heavier than ordinary wood wheels.

THE TIRES are 30" x 5" high pressure 6 ply dual rear, standard equipment; High Pressure 32" x 6" single 10 ply front and rear can be furnished at extra cost. Firestone rims. Solid, front 34"x4"; rear 34 x 6", at extra cost.

THE GASOLINE TANK is located on the side of the frame. The capacity is 20 gallons. The tank is constructed of No. 20 gauge terne plate. The header plates are stamped dished section and fastened in place by a lapped and rolled seam joint which is also soldered. The tank has a drain plug at the bottom and a gasoline gauge. Stewart Vacuum System is used.

HEADLIGHTS are the new type having controllable beam. The large bulb has double filaments and produces the high or long distance light for country work on the lower filament, while the upper filament produces a short flood light for city driving. An additional bulb with single filament furnishes parking lights.

The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell and rim are chrome finish.

The lenses comply with all state requirements.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing points and a high pressure Alemite grease gun furnished with each truck as standard equipment.

PAINT. All Stewart truck chassis are painted Stewart standard green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.

MODEL 29, 29X and 29XW—2 TON Specifications

- Rated Capacity - - 4000 pounds.
- Wheel Base - - - Standard 145". Special 160" and 176".
- Tread - - - - - Front, for 29, 29X and 29XW, 60 $\frac{3}{4}$ "; rear, for 29 and 29X, 64 $\frac{3}{4}$ " dual; rear, for 29XW, 65 $\frac{1}{2}$ " dual.
- Tire Equipment - - Standard, 32"x6" 8-ply duals rear 32"x6". 10 ply duals rear at extra cost.
- Chassis Weight - - 4400 pounds. Standard wheelbase.
- Body Length - - - From 10 ft. to 15 ft., depending on wheel base.
- Engine - - - - - MODEL 29X and 29XW—Six cylinder, size 3 $\frac{1}{4}$ x4 $\frac{1}{2}$ ". Piston Displacement, 224 cu. in. Horse Power 25.4 S.A.E. Actual 61 H.P. at 2600 R.P.M. Maximum Torque 142 foot pounds. Cooling — Centrifugal Pump.
Carburetor—Stromberg. S. A. E. 1 $\frac{1}{4}$ " Flange.
MODEL 29 and 29W—4 cylinder size 4"x5". Piston Displacement, 251.3 cu. in. Horse power 25.6 S.A.E. Actual 44 H.P. at 2000 R.P.M.
Maximum torque 149 foot pounds. Cooling, centrifugal pump. Carburetor. Stromberg. S. A. E. 1" flange.
- Rear Axle Ratio - - 29 and 29X—6.37:1 Bevel Gear, Standard. Special ratios—at extra cost—7.28:1.
29XW—7.66:1 Worm Gear, Standard. Special ratios—at extra cost—6 $\frac{1}{4}$:1.

- Transmission - - - Standard Four Speed.
- Transmission Ratios Low, 6.5-1; Second, 3.91-1; Third, 2.06-1; High, 1-1; Reverse, 8.1-1.
- Turning Radius - - 26 feet.
- Brakes - - - - - Foot brakes, Bendix, Duo-Servo four wheel, mechanical. Size front —16"x2", rear 16"x2½" on 29 and 29X and 17¼"x3" on 29XW. Hand brake on transmission, size 8½"x4".
- Gasoline Tank - - - Located on side of frame. Capacity 20 gallons. Stewart Vacuum System with booster. Gasoline gauge.
- Frame - - - - - Depth 7½", width 2¾", steel 7/32" thick.
- Front Springs - - - Size 38½" long, 2¼" wide, ten leaves.
- Rear Springs - - - Size 50" long, 3" wide, twelve leaves in main spring and 6 leaves in the helper.
Special Underslung springs, 60" long, 3" wide, for easy riding at extra price. Helper springs furnished standard on overhung springs.
- Radius Rods - - - Standard equipment on all chassis with standard overhung springs with helpers. Not furnished on underslung springs.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric horn and battery; vacuum tank with booster and gas filter; tool kit, jack, rear tire carrier, spare rim, speedometer, windshield wiper and mirror on all bodies and cabs, carburetor air cleaner, thermostat, gasoline gauge, stop light, and Alemite grease gun. The instrument board is equipped with ammeter, oil gauge, starting choke button, lighting and ignition switches and indirect dash light.

Models 29, 29X and 29XW—Mechanical Description

MODEL 29 MOTOR—4 CYLINDER: This motor has four cylinders cast enbloc, vertical "L" head type with detachable cylinder head and detachable block. The bore is 4" with 5" stroke, having large water spaces and centrifugal pump cooling system. The base is designed for a three point suspension in the frame. The cylinders and crank case are made of gray cast iron. The case is heavily ribbed to prevent distortion and has five crank shaft bearing supports. The lower half of the crankcase or oil pan is made of pressed steel and is easily removable, allowing complete access to all crank shaft and rod bearings, oil pump and the complete oiling system of the motor. The bell housing which encloses the fly wheel is so constructed that the fly wheel may be removed by simply taking off the lower half of the bell housing and removing the bolts which hold the flywheel to the crankshaft.

The starting crank is of the removable type. The starting crank shaft opening is covered with an aluminum cap when the starting crank is not in place. The motor gears are located at the front end of the motor. They are helical spur gears and are 1" wide.

THE OILING SYSTEM of the motor is the forced feed, pressure type. Oil pressure is maintained by means of a gear pump which is located about the centre of the engine and driven from the cam shaft by means of spiral gears. An adjustable oil pressure relief valve is provided and this is connected with the foot accelerator. The oil is pumped from the base to the oil distributing tube which is cast into the crank case and then flows thru holes drilled in the crank case webs directly to the crankshaft and cam shaft bearings. Oil holes drilled in the crank shaft lead the oil to the lower connecting rod bearings. The oil pressure varies from 15 pounds at idling speeds to about 60 pounds at high speed. With this system of connecting up the pressure regulator with the carburetor throttle, the volume of oil is low when the motor is not working hard and rises to full volume as the throttle is opened wide.

THE CRANKSHAFT is rather unusual for a four cylinder motor as it has five main crank shaft bearings. The shaft is drop forged from .40—.50 open hearth carbon steel, double heat treated, machined, ground and then given a thorough test on a specially designed balancing machine. This kind of design produces a motor which is unusually durable and rugged. The five crank shaft bearings align the shaft in a very rigid position, prevent excessive vibration and produce long life. All crank shaft bearings are bronze backed.

Size of front	crank shaft bearing	$2\frac{1}{8}'' \times 2\frac{11}{16}''$
Size of second	crank shaft bearing	$2\frac{1}{8}'' \times 1\frac{3}{8}''$
Size of third	crank shaft bearing	$2\frac{1}{8}'' \times 1\frac{13}{16}''$
Size of fourth	crank shaft bearing	$2\frac{1}{8}'' \times 1\frac{3}{8}''$
Size of rear	crank shaft bearing	$2\frac{1}{8}'' \times 2\frac{11}{16}''$

THE CAM SHAFT is machined from a drop forging, heat treated and ground. All cams are integral with the shaft. The shaft is $1\frac{1}{8}''$ in diameter and has four bearings.

Size of front	cam shaft bearing	$2.04'' \times 2\frac{1}{8}''$
Size of second	cam shaft bearing	$2'' \times \frac{7}{8}''$
Size of third	cam shaft bearing	$1.97'' \times \frac{7}{8}''$
Size of rear	cam shaft bearing	$1.94'' \times 2''$

THE CONNECTING RODS are "I" beam section of open hearth steel, drop forged, heat treated, machined and ground. The rods are $11\frac{15}{16}''$ long. All connecting rod bolts for holding on the caps are nickel steel. The lower end of the rod is provided with a bronze backed, babbitt bearing and the upper end is bronze bushed. All connecting rods are carefully balanced.

THE VALVES are located on the right hand side of the motor and are all enclosed by means of a removable pressed steel plate. All exhaust valves are made of Silchrome steel and all inlet valves are carbon steel. The effective working diameter of both inlet and exhaust valves is $1\frac{5}{8}''$. The lift of all valves is $\frac{5}{16}''$. Angle of

seat 45° . The valve stems are hardened and are lubricated by means of splash from the motor base. The valve stems and push rods work in separate removable bushings. The valve lifters are mushroom type.

THE RADIATOR FAN has four pressed steel blades 16" in diameter. The rotation looking at the front end of the motor is clockwise. The drive pulley is $3\frac{7}{8}$ " diameter and made for a "V" belt, $\frac{5}{8}$ " wide and 38 degree included angle. The pulley on the fan is $3\frac{1}{4}$ " diameter. The fan has a vertical adjustment for taking up slack in the fan belt.

THE FLYWHEEL is made of a special mixture of cast iron. Teeth are cut in the outside rim for the starter gear. The flywheel is carefully balanced at all speeds to insure against vibration.

THE PISTONS are made of aluminum alloy. After being machined, they are ground to limits of one-half thousandth. Special care is taken in boring and reaming the piston pin holes to insure a perfect fit and alignment. The piston is 4" diameter and $4\frac{7}{8}$ " long. There are three piston rings, each $\frac{3}{16}$ " wide. The two upper rings are plain and the lower is a special oil ring. Below the lower ring an oil groove is cut in the piston with holes drilled thru to the inside. All pistons are carefully weighed and held to close limits to avoid the possibility of vibration. The piston pins are $1\frac{1}{8}$ " in diameter, hardened and ground to size. The pin is clamped in the connecting rod and floats in the piston bosses.

THE SPARK PLUGS are located in the top of the cylinder head. They are $\frac{7}{8}$ -18 U.S.F. thread.

THE LIGHTING GENERATOR is of the 6 volt type with third brush adjustment for output. The generator is bolted directly to the crank case at the forward right hand side by means of a standard S.A.E. Flange. It is driven directly by the motor timing gears.

THE DISTRIBUTOR is located at the right hand side of the motor at the front and is driven off the cam shaft by means of a set of spiral gears. Looking down on top of the distributor it rotates clockwise.

THE STARTING MOTOR is located on the left hand side at the rear. It is attached to the motor by means of Standard S.A.E. flange on the flywheel housing. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

STANDARD IGNITION is by battery and distributor. However magneto ignition can be furnished on special order.

Model 29X and 29XW—Mechanical Description

This motor has six cylinders, cast enbloc, vertical "L" head type, with detachable cylinder block and detachable cylinder head. The cylinders are made of a special close grained, gray iron. There are large water spaces around the cylinders and valves and over the combustion chamber.

The motor size is $3\frac{1}{4}$ " bore by $4\frac{1}{2}$ " stroke and actually develops 61 H.P. at 2600 R.P.M. The motor is designed for three point suspension, the two rear motor arms resting on solid rubber pads.

The crank case is made of cast iron and is strongly ribbed to prevent distortion at any point. Four heavy ribs are cast in the base to support the four crank shaft bearings. The crank case is machined for standard No. 3 S.A.E. transmission mounting.

The oil pan is made of pressed steel with the oil pump located in the centre of the pan. The pan is easily removable, which allows complete access to all crank shaft and rod bearings and to the oil pump.

The intake and exhaust manifolds are of the Swan type with a hot spot to assist in vaporizing the fuel.

The crank shaft is so designed that the pistons can be drawn down past the crank throws to get them out with-

out the necessity of removing the cylinder head. The bell housing which encloses the flywheel is so constructed that the lower half may be removed.

THE OILING SYSTEM is a full force feed, pressure system. Pressure is maintained by means of a submerged gear pump located in the centre of the motor base. The pump is driven by means of a set of spiral gears from the cam shaft. The crank shaft is hollow drilled to distribute oil to the main bearings.

The oil pressure is controlled by a regulator valve to give constant pressure at all engine speeds. Piston and cylinders are lubricated by oil thrown from the upper and lower ends of the connecting rods. Timing gears are fed positively from the oiling system.

THE CRANKSHAFT has four main bearings and is $2\frac{3}{8}$ " diameter. It is dropped forged from .40-.50 open hearth steel, double heat treated, machined, ground to size, hollow drilled for oil feeds and then balanced on a special crankshaft balancing machine at high speeds. The main crankshaft bearings are as follows:

Size of front	crank shaft bearing	$2\frac{3}{8}" \times 2\frac{1}{16}"$
Size of second	crankshaft bearing	$2\frac{3}{8}" \times 1\frac{3}{4}"$
Size of third	crankshaft bearing	$2\frac{3}{8}" \times 2"$
Size of rear	crankshaft bearing	$2\frac{3}{8}" \times 2\frac{3}{8}"$

The rear end of the crankshaft has a heavy flange to which the flywheel is bolted. All main bearings are bronze backed and babbitt lined.

THE CAM SHAFT is drop forged from 20 carbon open hearth steel. All cams and bearings are forged integral, heat treated, machined and ground to size. All cams are tested with the scleroscope for a required degree of hardness. The cam shaft is $1\frac{1}{8}"$ diameter and is supported on five bearings.

Size of front	cam shaft bearing	2"x1 7/8"
Size of second	cam shaft bearing	2"x1"
Size of third	cam shaft bearing	2"x1 1/16"
Size of fourth	cam shaft bearing	2"x1 1/16"
Size of rear	cam shaft bearing	2"x1 1/2"

THE CONNECTING RODS are dropped forged from .30-.40 open hearth, carbon steel. They have the "I" beam section and are double treated. They are 9" long from centre to centre. The large connecting rod bearings are pressure cast directly into the large end of the connecting rod, by a centrifugal process which ensures the proper density of the metal. The upper connecting rod ends are bushed with bronze. The lower connecting rod bearings are 2 1/8" x 1 1/2". The upper bronze bushing are 7/8" x 1 7/16".

THE VALVES are entirely enclosed and the valve chamber is flooded with oil from the motor base. There are two valve cover plates, made of pressed steel. When these plates are removed the valves are easy to reach for adjustment.

The exhaust valves are made of Silchrome steel, especially designed to resist the high temperature of the exhaust gases. The inlet valves are made of nickel steel. The exhaust valves are 1 15/32" diameter and the inlet valves 1 5/8" diameter. All valves have a lift of 5/16". Inlet valves have 30° angle seats and exhaust valves have 45° angle seats.

The valve lifters are the standard mushroom type carefully hardened and ground. They are flooded with oil from the crank case. Screwed into the stem of the valve lifter is an adjusting screw with a special hardened head, held in position with a lock nut. The valves are adjusted by means of this screw.

THE WATER PUMP is located on the right hand side of the motor just back of the centre of the cylinder block. The pump is the conventional centrifugal type. It is

attached to the side of the cylinder block for support and is driven by means of a flexible hose coupling from the rear of the generator shaft.

THE RADIATOR FAN has four pressed steel blades. It is located on a vertical adjustable bracket on the front end of the cylinder block. It is driven by a "V" type fan belt which is $\frac{3}{4}$ " wide across the top. The included angle of the fan belt is 38° . The lower pulley, located on the crank shaft is $5\frac{1}{4}$ " diameter and the fan pulley is 4" diameter.

THE FLYWHEEL is attached to the crankshaft flange with six bolts. These are dimensioned bolts and the holes are reamed to size. The flywheel is made of cast iron and a steel ring gear with teeth for the starter is pressed on. The flywheel is machined for multiple disc, dry plate clutch and is carefully balanced to prevent vibration.

THE PISTONS are made of a special fine cast gray iron. They are $3\frac{1}{4}$ " diameter and 4" long. They have four piston rings at the top of the piston. The three top rings are plain cast iron $\frac{1}{8}$ " wide. The lower ring is a special oil wiper ring $\frac{3}{16}$ " wide. All pistons are weighed and held within close limits. The piston pins are $\frac{7}{8}$ " diameter. They are made from open hearth steel, heat treated and ground to size.

THE SPARK PLUGS are located in the top of the cylinder head. They are $\frac{7}{8}$ "—18 U.S.F. thread.

THE LIGHTING GENERATOR is a Delco-Remy Unit, delivering a six volt current and has the third brush regulation for current output. It is located on the right hand side of the motor and is attached to the rear side of the timing gear case by means of Standard S.A.E. flange. The generator is driven by the timing gears at $1\frac{1}{4}$ times motor speed. Rotation looking at the driving end of the generator is clockwise.

THE DISTRIBUTOR is mounted on top of the cylinder head about the centre of the block. It is driven from the camshaft by means of a set of spiral cut gears. Looking down on the top of the distributor the rotation is clockwise.

THE STARTING MOTOR is mounted on the right hand side of the motor at the rear. It is attached to the front face of the flywheel housing by S.A.E. standard flange. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

THE STANDARD IGNITION is by battery but a magneto equipped unit can be furnished on special order.

THE TRANSMISSION is a four speed unit power plant type which bolts directly to the flywheel housing of the motor. The transmission gears have a $\frac{3}{4}$ " width of face and are cut 6-8 pitch which produces exceptionally strong teeth. After the gears are cut they are first carbonized and then given a double heat treatment which produces maximum hardness on the gear tooth surface and maximum toughness inside. They are made $3\frac{1}{2}\%$ nickel steel.

The main transmission shaft has 10 large splines which drive the gears. These shafts are made of $3\frac{1}{2}\%$ nickel steel, carefully heat treated and ground to size.

Annular ball bearings are used on the main shaft and on the countershaft. The main shaft front bearing is No. 209. Main shaft rear bearing is No. 307. Front countershaft bearing No. 305 and rear No. 305.

The transmission gear ratios are arranged as follows: Low, 6.5-1; Second, 3.9-1; Third, 2.06-1; High, 1-1; Reverse, 8.1-1.

The rear axle ratio is 6.37-1 for bevel axle. Therefore the total gear reductions from motor to rear axle are as follows:

Low, 41.5-1; Second, 24.8-1; Third, 12.8-1; High, 6.37-1; Reverse, 51.6-1.

The worm gear axle ratio is 7.66-1. Therefore, the total reductions are as follows: Low, 49.8-1; Second, 29.9-1; Third, 15.4-1; High, 7.66-1; Reverse, 62-1.

THE CLUTCH is the dry plate, multiple disc type which consists of one set of plain steel plates and another set of steel discs lined on both sides with asbestos fabric facings. The steel plates are $\frac{1}{16}$ " thick, made from saw blade steel and properly hardened. The outside edges of the asbestos covered clutch discs are cut with small gear teeth which fit with similar teeth cut in the inside face of the clutch driving drum. This method of construction provides large wearing surfaces and prevents noise. The clutch drum is bolted to the flywheel in such a way as to prevent the possibility of its becoming loose. There are a total of 11 plates in the clutch, six double faced plates and five plain steel plates together with the two header plates. The plates are all 8" outside diameter and 6" inside diameter, which gives a total clutch area of 264 square inches.

The clutch spring is made of a single coil of rectangular spring steel, calibrated to give the exact desired compression.

The clutch shaft is $1\frac{3}{8}$ " in diameter, made from $3\frac{1}{2}\%$ nickel steel, heat treated and ground to size. It is piloted into the flywheel with a No. 205 annular ball bearing which is provided with a grease retaining ring.

The clutch release trunnion is equipped with a specially designed ball-thrust bearing provided with a grease retaining ring. Both the pilot and clutch throw-out bearings have positive means of lubrication.

THE FRONT AXLE is the reverse Elliott type, with a drop forged, heat treated "I" beam of open hearth steel. The beam is $2\frac{1}{4}$ " wide by $2\frac{5}{8}$ " deep. The spring pads are forged integral with the beam.

The wheel spindles are made of nickel steel and heat treated. They are $1\frac{5}{8}$ " diameter at the inside bearing and $1\frac{1}{8}$ " diameter at the outside bearing. The pivot bolt is $1\frac{1}{8}$ " diameter, made of nickel steel, heat treated and ground. A Timken roller bearing No. 1215 is located in each spindle yoke head for the purpose of insuring easy steering. The steering ball on the axle arm is $1\frac{1}{8}$ " diameter. The steering cross rod is solid and is

equipped at each end with special ball and socket joints, which eliminates any possibility of the front axle cramping while turning.

The wheel bearings are the latest type Timken roller and are adjustable. The inside wheel bearing is Timken No. 419-412 and the outside is Timken No. 316-312. The front axle tread is $60\frac{3}{4}$ ".

THE 29 and 29X REAR AXLE is of the full floating, spiral bevel gear construction. The axle housing is cast steel of the banjo type. The rear axle cover plate is a pressed steel part.

The spiral bevel gear is made of $3\frac{1}{2}$ " nickel steel and the pinion is made of 5% nickel steel and the teeth are carefully carbonized and hardened. The tooth face is $1\frac{11}{16}$ ". The standard gear ratio is 6.37-1. Special ratio 7.28-1 at extra cost.

The differential is the four pinion type and is mounted on two Timken roller bearings No. 397-394. These bearings are easily adjustable after the rear axle cover plate has been removed.

The spiral bevel pinion is straddle mounted on annular ball bearings. The front pinion bearing is a double row No. 5310 and the rear pinion bearing is a single row No. 1306. The pinion shaft end is finished Standard $1\frac{3}{8}$ " S.A.E. Taper.

The full floating axle drive shafts are made of high carbon, nickel steel. They are $1\frac{11}{16}$ " diameter full length except the differential ends are slightly enlarged where the splines are cut in.

The wheel bearings are mounted on a seamless steel tube reinforcing sleeve, $2\frac{5}{8}$ " in diameter which extends for some distance into the axle housing. There are two Timken wheel bearings on each wheel, No. 480-472-A. The rear axle tread is approximately $64\frac{3}{4}$ " with dual tires.

THE 29XW REAR AXLE is a Timken, full floating, overhead worm drive type. The axle housing is cast steel with walls $\frac{7}{16}$ " thick. The axle housing is reinforced with nickel steel wheel bearing sleeves, $2\frac{11}{16}$ " diameter.

The worm is made of a special electric furnace molybdenum steel, carbonized and hardened, with the worm thread ground to extreme accuracy for lead and index thread. The worm shaft is mounted on two Timken roller bearings, No. 44348-44150, at the rear end and a Hyatt roller bearing No. 406 at the front end. The two Timken bearings at the rear are placed back to back so that the worm thrust, in both directions, is taken on these two bearings. The worm front end is finished with S.A.E. $1\frac{1}{2}$ " Standard taper.

The worm wheel is made from Timken Special Processed Phosphor bronze. The teeth in the worm wheel are cut with the greatest accuracy. A new form of worm gear tooth has recently been developed which gives these gears about five times the life of previous type gears. The worm wheel is securely riveted to a large, four pinion, block type differential. The differential is mounted on two Timken taper roller bearings, No. 452-462, which are readily adjustable. The standard gear ratio is 7.66:1 and special ratio of $6\frac{1}{4}$:1 at extra cost.

The full floating axle shafts are made of nickel chromium alloy steel and are $1\frac{3}{4}$ " in diameter at the smallest place. The inner ends are splined while the outer ends have upset driving flanges forged integral with the shaft.

The wheel bearings are mounted on the nickel steel, reinforced wheel spindle which is $2\frac{3}{4}$ " in diameter and made from $\frac{3}{8}$ " stock. This spindle reinforces the axle housing way in, close to the differential. Each wheel has two Timken roller bearings No. 472-480. The rear axle tread is approximately $65\frac{1}{2}$ " with dual tires.

THE DRIVE SHAFT is made of high carbon seamless steel tubing 2" in diameter. This tubing is carefully selected and tested for true running balance at high

speeds. The tube walls are .109" thick and uniform.

The Spicer universal joints are tightly enclosed in pressed steel cases which retain the lubricant and keep out the dirt. The cases are provided with adjustable locks to hold them tightly in position. The yokes of the joints are made of molybdenum steel, heat treated and ground to size. All pins and bushings are also of steel and are hardened and ground to accurate dimensions so that all parts are interchangeable. This drive shaft assembly has three joints with a centre support. The centre support consists of a malleable iron housing which holds a S.K.F. self aligning ball bearing and is bolted to the center cross member of the frame by means of a flat steel support.

THE FOOT BRAKES are the Bendix Duo-Servo four wheel brakes. They are the self energizing type brake which has a very powerful action without excessive foot pressure. They are all internal expanding and are entirely enclosed both front and rear and are mechanically operated by the foot pedal. The braking effort is so distributed that 65% goes to the rear wheels and 35% to the front. The rear brakes are 16"x2½" on 29 and 29X and 17¼"x3" on 29XW and the front 16"x2".

THE HAND BRAKE is located at the rear end of the transmission. The brake band is supported by a heavy bracket attached to the end of the transmission case. The brake drum is securely riveted to the universal joint flange. The brake is of the external contracting band type. It is 8½" in diameter and 4" wide. The brake lining is ¼" thick and will wear for a long time. A thumb nut adjustment provides means for tightening up the band as the lining wears down. The Hand Brake should be used only for parking purposes and in an emergency. The foot pedal, which operates the Bendix Brakes on all four wheels, should be used for all ordinary braking purposes.

THE STEERING GEAR is the Ross Cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is $1\frac{3}{4}$ " diameter, is made of seamless steel tubing and finished with baked black enamel. The steering wheel is 18" diameter and made up of laminated wood sections. The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is $1\frac{1}{8}$ " diameter, hardened and ground to size. The spark and throttle controls and the horn button are mounted in the center of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

THE FRAME is made of .20-.25 carbon open hearth steel, carefully selected and tested. Samples showing excess phosphorus or sulphur content are rejected.

The side rails are tapered from front to rear and are $7\frac{1}{2}$ " deep at the center section. The upper flange is $2\frac{3}{4}$ " wide. The lower flange is $2\frac{1}{4}$ " wide. The thickness of the steel in the side rails is $\frac{7}{32}$ ". Three cross members with heavy gussets are hot riveted to the side rails. The overall width of the frame from front to rear is 32". The length varies with the wheelbase.

THE SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated.

The front springs are $38\frac{1}{2}$ " long by $2\frac{1}{4}$ " wide. The rear springs are 50" long by 3" wide. Front spring pins are $\frac{3}{4}$ " diameter and $1\frac{1}{4}$ " diameter on the rear springs. Special underslung rear springs can be furnished at extra cost. They carry the same load as the regular springs but are easier riding. These springs are 60" long and 3" wide. Helper springs are furnished Standard on overhung springs.

THE RADIATOR is pressed steel, shell type, chrome plated. The upper and lower tanks and core are made up in one unit. The core is the cellulosic type. It is suspended in the radiator shell by means of side supports bolted to the shell. The radiator has a frontal area of 400 square inches. The core is $2\frac{3}{4}$ " thick. The water capacity of the radiator and motor is approximately $5\frac{1}{2}$ gallons.

THE THERMOSTAT regulates the temperature of the water in the motor. It is inserted in the water manifold on top of the cylinder head between the motor and the radiator. When the water is cold the thermostat valve is closed. This cuts off the water circulation until the water in the motor becomes hot at which time the thermostat valve commences to open and again allows water circulation. At about 175 degrees temperature the valve is full open in which position it will stay until the water again commences to cool off when it will automatically close.

THE STORAGE BATTERY is a six volt type, 126 ampere hour capacity. It has a molded hard rubber case and is mounted in a watertight box on the left hand running board. The battery is held by means of two clamp bolts, in such a way that no strain is put on the case. The battery is easily removable.

THE WHEELS are the malleable steel type with six spokes, both front and rear. The spokes are hollow and the wheels very strong although they are but very little heavier than ordinary wood wheels.

THE TIRES are, Front 32" x 6" Pneu.; rear 32" x 6" Pneu. Dual, 8 ply Standard. Special front 32" x 6" Pneu.; rear 32"x6" Dual Pneu. 10 ply at special price.

THE GASOLINE TANK is located on the side of the frame. The capacity is 20 gallons. The tank is constructed of No. 20 gauge terne plate. The header plates

are stamped dished section and fastened in place by a lapped and rolled seam joint which is also soldered. Stewart Vacuum System is used. The tank has a drain plug at the bottom and a gasoline gauge.

HEADLIGHTS are the new type having controllable beam. The large bulb has double filaments and produces the high or long distance light for country work on the lower filament, while the upper filament produces a short flood light for city driving.

An additional bulb with single filament furnishes parking lights.

The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell and rim are chrome finish.

The lens comply with all state requirements.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing points and a high pressure Alemite grease gun furnished with each truck as standard equipment.

PAINT. All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.

MEMORANDUM

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MODEL 26XW—2 TON

Specifications

- Rated Capacity - - 4000 pounds.
- Wheel Base - - - - Standard 165". Special 148", 176" and 190".
- Track - - - - - Front 60 $\frac{3}{4}$ ". Rear, with dual tires, is 65 $\frac{1}{2}$ ".
- Tire Equipment - - Standard Front 32"x6" Pneu., Rear 32"x6" Pneu. Dual, 8 Ply. Special Front 32"x6" Pneu., Rear 32"x6" Dual Pneu., 10 Ply, at extra cost.
- Chassis Weight - - 5095 lbs. standard wheelbase 165".
- Body Length - - - From 10 ft. to 15 ft., depending on wheel base.
- Engine - - - - - Six cylinder, size 3 $\frac{5}{8}$ "x5".
Piston displacement 310 cu. in.
Horse Power 31.54 S.A.E. Actual 75 at 2750 R.P.M.
Maximum Torque 195 ft. pounds.
Cooling—Centrifugal pump.
Carburetor—Stromberg. S. A. E. 1 $\frac{1}{2}$ " flange.
Counter balanced crankshaft.
- Rear Axle Ratio- - Standard, 7.66:1 Worm Gear. Special ratio—at extra cost—6 $\frac{1}{4}$:1.
- Transmission Ratios Low 6.5-1; Second 3.9-1; Third 2.06-1; High 1-1; Reverse 8.1-1.
- Turning Radius - - 26 feet on standard wheelbase and tires.
- Brakes - - - - - Foot brakes, Bendix Duo-Servo four wheel, mechanical. Size front—16"x2", rear 17 $\frac{1}{4}$ "x3". Hand brake on transmission, size 8 $\frac{1}{2}$ "x4".

- Gasoline Tank - - - Located on side of frame. Capacity 31 gal., Stewart vacuum system with booster.
Gasoline gauge.
- Frame - - - - - Depth $7\frac{1}{2}$ ", width $2\frac{3}{4}$ ", steel $\frac{1}{4}$ " thick.
- Front Springs - - - Size $38\frac{1}{2}$ " long, $2\frac{1}{4}$ " wide, 11 leaves.
- Rear Springs - - - Size 50" long, 3" wide, 14 leaves in main spring and 6 leaves in the helper. Special Underslung springs, 60" long, 3" wide, for easy riding at extra price. Helper springs are furnished standard on overhung springs.
- Radius Rods - - - Standard Equipment on all chassis with standard overhung springs with helpers. Not furnished on underslung springs.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric horn and battery; vacuum tank with booster and gas filter; tool kit, jack, rear tire carrier, spare rim, speedometer, windshield wiper and mirror on all bodies and cabs, carburetor air cleaner, thermostat, gasoline gauge, stop light and Alemite grease gun. The instrument board is equipped with ammeter, oil gauge, starting choke button, lighting and ignition switches and indirect dash light.

Model 26XW—Mechanical Description

MOTOR—6 CYLINDER: This motor has six cylinders, cast enbloc, vertical "L" head type, with detachable cylinder block and detachable cylinder head. The cylinders are made of a special close grained, gray iron. There are large water spaces around the cylinders and valves and over the combustion chambers.

The motor size is $3\frac{5}{8}$ " bore by 5" stroke and actually develops 75 H.P. at 2750 R.P.M. The motor is designed for three point suspension.

The crank case is made of cast iron and is strongly ribbed to prevent distortion at any point. Four heavy ribs are cast in the base to support the four crankshaft bearings. The crank case is machined for standard No. 3 S.A.E. transmission mounting.

The oil pan is easily removable, which allows complete access to all crank shaft and rod bearings and to the oil pump.

The intake and exhaust manifolds are of the Swan type with a hot spot to assist in vaporizing the fuel.

The crank shaft is of the counterbalanced type to reduce vibration to a minimum.

The bell housing which encloses the flywheel is so constructed that the lower half may be removed.

THE OILING SYSTEM is a full force feed, pressure system. Pressure is maintained by means of a submerged gear pump located in the centre of the motor base. The pump is driven by means of a set of spiral gears from the cam shaft. The crank shaft is hollow drilled to distribute oil to the main bearings. The connecting rods are rifle drilled to conduct oil to the piston pins.

The oil pressure is controlled by a regulator valve to give constant pressure at all engine speeds. Piston and cylinders are lubricated by oil thrown from the upper and lower ends of the connecting rods. Timing gears are fed positively from the oiling system.

THE CRANKSHAFT has four main bearings and is $2\frac{3}{4}$ " diameter. It is drop forged from .40-.50 open hearth steel, double heat treated, machined, ground to size, hollow drilled for oil feeds and then balanced on a special crankshaft balancing machine at high speeds. The crankshaft is counter balanced with the weights welded in position. The crankshaft bearings are as follows:

Size of front	crank shaft bearing,	$2\frac{3}{4}'' \times 2\frac{3}{4}''$
" " second	" " "	$2\frac{3}{4}'' \times 2\frac{1}{4}''$
" " third	" " "	$2\frac{3}{4}'' \times 2\frac{1}{4}''$
" " rear	" " "	$2\frac{3}{4}'' \times 2\frac{3}{4}''$

The rear end of the crank shaft forging has a heavy flange to which the flywheel is bolted. All main bearings are bronze backed and babbit lined.

THE CAM SHAFT is drop forged from .20 carbon steel. All cams and bearings are forged integral, heat treated, machined and ground to size. All cams are tested with the scleroscope for a required degree of hardness. The cam shaft is $1\frac{1}{8}''$ diameter and is supported on five bearings.

Size of front	cam shaft bearing,	$2.04 \times 2\frac{1}{8}''$
" " second	" " "	$2.01 \times 1''$
" " third	" " "	$1.990 \times 1''$
" " fourth	" " "	$1.96 \times 1''$
" " rear	" " "	$1.94 \times 1\frac{1}{2}''$

THE CONNECTING RODS are drop forged from .30-.40 open hearth carbon steel. They have the "I" beam section and are double heat treated. They are $10\frac{3}{4}''$ long from centre to centre. The connecting rods are rifle drilled to permit the passage of oil from the crank shaft to the piston pin bearings. The large connecting rod bearings are pressure cast directly into the large end of the connecting rod by a centrifugal process which ensures the proper density of the metal. The upper connecting rod ends are bushed with bronze. The lower connecting rod bearings are $2\frac{1}{2}'' \times 1\frac{5}{8}''$. The upper bronze bushings are $1\frac{1}{8}'' \times 1\frac{3}{8}''$.

THE VALVES are entirely enclosed and the valve chamber is flooded with oil from the motor base. There are two valve cover plates, made of pressed steel. When these plates are removed the valves are easy to reach for adjustment.

The exhaust valves are made of Silchrome steel especially designed to resist the high temperature of the

exhaust gases. The inlet valves are made of nickel steel. The exhaust valves are $1\frac{11}{16}$ " diameter and the inlet valves $1\frac{13}{16}$ " diameter. All valves have a lift of $\frac{5}{16}$ ". Seat angle is 45° for both.

The valve lifters are the standard mushroom type carefully hardened and ground. They are flooded with oil from the crank case. Screwed into the stem of the valve lifter is an adjusting screw with a special hardened head, held in position with a lock nut. The valves are adjusted by means of this screw.

THE WATER PUMP is located at the front end of the cylinder block at the top and is driven, together with the radiator fan by a V rubber belt from a pulley on the crank shaft. The pump is of the centrifugal type and the shaft is mounted on a roller bearing and provided with suitable stuffing box to prevent water leakage.

THE RADIATOR FAN is mounted on the front end of the pump shaft and is driven by the V shape rubber belt which also drives the water pump. The upper fan belt pulley is adjustable for the purpose of taking up slack in the belt. The fan has four pressed steel blades which are 20" in diameter. The rotation looking at the front end of the motor is clockwise. The drive pulley is 6" in diameter and the fan pulley $4\frac{3}{4}$ " in diameter. The V belt is $\frac{7}{8}$ " wide with 38 degrees included angle.

THE FLYWHEEL is attached to the crankshaft flange with six bolts. These are finished bolts and the holes are reamed to size. The flywheel is made of cast iron and a steel ring gear with teeth for the starter is pressed on. The flywheel is machined for multiple disc dry plate clutch and is carefully balanced to prevent vibration.

THE PISTONS are made of a special fine gray cast iron. They are $3\frac{5}{8}$ " diameter and $4\frac{3}{8}$ " long. They have four piston rings at the top of the piston. The piston rings are $\frac{3}{16}$ " wide. The three top rings are plain cast iron. The lower ring is a special oil wiper ring. All pistons are weighed and held within close limits.

THE SPARK PLUGS are located in the top of the cylinder head. They are $\frac{7}{8}$ " 18 U.S.F. thread.

THE LIGHTING GENERATOR is a Delco-Remy unit delivering a six volt current. It is attached to the motor on the right hand side at the front by standard S.A.E. Flange on the gear case housing and is driven by the front timing gears. The generator rotates at $1\frac{1}{2}$ times crank shaft speed. Rotation looking at the driving end of the generator is clockwise.

THE DISTRIBUTOR is mounted on the top of the cylinder head and driven by means of a set of spiral gears. The rotation, looking down on the distributor, is clockwise.

THE STARTING MOTOR is mounted on the right hand side of the motor at the rear. It is attached to the front face of the flywheel housing by S.A.E. flange type mounting. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

THE STANDARD IGNITION is a battery but a magneto equipped unit can be furnished on special order.

THE TRANSMISSION is a four speed unit power plant type which bolts directly to the flywheel housing of the motor. The transmission gears have a $\frac{3}{4}$ " width of face and are cut 6-8 pitch which produces exceptionally strong teeth. After the gears are cut they are first carbonized and then given a double heat treatment which produces maximum hardness on the gear tooth surface and maximum toughness inside. They are made from $3\frac{1}{2}\%$ nickel steel.

The main transmission shaft has 10 large splines which drive the gears. These shafts are made of $3\frac{1}{2}\%$ nickel steel, carefully heat treated and ground to size.

Annular ball bearings are used on the main shaft and on the countershaft. The main shaft front bearing is No. 209. Main shaft rear bearing is No. 307. Front countershaft bearing No. 305 and rear No. 305.

The transmission gear ratios are arranged as follows: Low 6.5-1; Second 3.9-1; Third 2.06-1; High 1-1; Reverse 8.1-1.

The rear axle ratio is 7.66:1. Therefore the total reductions are as follows: Low 49.8:1; Second 29.9:1; Third 15.4:1; High 7.66:1; Reverse 62:1.

THE CLUTCH is the dry plate, multiple disc type which consists of one set of plain steel plates and another set of steel discs, lined on both sides with asbestos fabric facings. The steel plates are $\frac{1}{16}$ " thick, made from saw blade steel and properly hardened. The outside edges of the asbestos covered clutch discs are cut with small gear teeth which fit with similar teeth cut in the inside face of the clutch driving drum. This method of construction provides large wearing surfaces and prevents noise. The clutch drum is bolted to the flywheel in such a way as to prevent the possibility of its becoming loose. There are a total of 11 plates in the clutch, six double faced plates and five plain steel plates, together with the two header plates. The plates are all 8" outside diameter and 6" inside diameter, which gives a total clutch area of 264 square inches.

The clutch spring is made of a single coil of rectangular spring steel, calibrated to give the exact desired compression.

The clutch shaft is $1\frac{3}{8}$ " in diameter, made from $3\frac{1}{2}\%$ nickel steel, heat treated and ground to size. It is piloted into the flywheel with a No. 205 annular ball bearing which is provided with a grease retaining ring.

The clutch release trunnion is equipped with a specially designed ball thrust bearing, provided with a grease retaining ring. Both the pilot and clutch throw-out bearings have positive means of lubrication.

THE FRONT AXLE is the reverse Elliott type, with a drop forged, heat treated "I" beam of open hearth steel. The beam is $2\frac{1}{4}$ " wide by $2\frac{5}{8}$ " deep. The spring pads are forged integral with the beam.

The wheel spindles are made of nickel steel and heat treated. They are $1\frac{5}{8}$ " diameter at the inside bearing and $1\frac{1}{8}$ " diameter at the outside bearing. The pivot bolt is $1\frac{1}{8}$ " diameter, made of nickel steel, heat treated and ground. A Timken roller bearing No. 1215 is located in each spindle yoke head for the purpose of insuring easy steering. The steering ball on the axle arm is $1\frac{1}{8}$ " diameter. The steering cross rod is solid and is equipped at each end with special ball and socket joints, which eliminates any possibility of the front axle cramping while turning.

The wheel bearings are the latest type Timken roller and are adjustable. The inside wheel bearing is Timken No. 419-412 and the outside is Timken No. 316-312. The front axle tread is $60\frac{3}{4}$ ".

REAR AXLE is a Timken, full floating, overhead worm drive type. The axle housing is cast steel with walls $\frac{7}{16}$ " thick.

The worm is made of a special electric furnace molybdenum steel, carbonized and hardened, with the worm thread ground to extreme accuracy for lead and index thread. The worm shaft is mounted on two Timken roller bearings, No. 44348-44150, at the rear end and a Hyatt roller bearing No. 406 at the front end. The two Timken bearings at the rear are placed back to back so that the worm thrust, in both directions, is taken on these two bearings. The worm front end is finished with S.A.E. $1\frac{1}{2}$ " Standard taper.

The worm wheel is made from Timken Special Processed Phosphor bronze. The teeth in the worm wheel are cut with the greatest accuracy. A new form of worm gear tooth has recently been developed which gives these gears about five times the life of previous type gears. The worm wheel is securely riveted to a large, four pinion, block type differential. The differential is mounted on two Timken taper roller bearings, No. 452-462, which are readily adjustable. The standard gear ratio is 7.66:1 and special ratio of $6\frac{1}{4}$:1 at extra cost.

The full floating axle shafts are made of nickel chromium alloy steel and are $1\frac{3}{4}$ " in diameter at the smallest place. The inner ends are splined while the outer ends have upset driving flanges forged integral with the shaft.

The wheel bearings are mounted on the nickel steel, reinforced wheel spindle which is $2\frac{3}{4}$ " in diameter and made from $\frac{3}{8}$ " stock. This spindle reinforces the axle housing way in, close to the differential. Each wheel has two Timken roller bearings No. 472-480. The rear axle tread is approximately $65\frac{1}{2}$ " with dual tires.

THE DRIVE SHAFT is made of high carbon seamless steel tubing 2" in diameter. This tubing is carefully selected and tested for true running balance at high speeds. The tube walls are .109" thick and uniform.

The Spicer universal joints are tightly enclosed in pressed steel cases which retain the lubricant and keep out the dirt. The cases are provided with adjustable locks to hold them tightly in position. The yokes of the joints are made of molybdenum steel, heat treated and ground to size. This drive shaft assembly has three joints with a centre support. The centre support consists of a malleable iron housing which holds a S.K.F self aligning ball bearing and is bolted to the centre cross member of the frame by means of a flat steel support.

THE FOOT BRAKES are the Bendix Duo-Servo four wheel brakes. They are the self energizing type brake which has a very powerful action without excessive foot pressure. They are all internal expanding and are entirely enclosed both front and rear and are mechanically operated by the foot pedal. The braking effort is so distributed that 65% goes to the rear wheels and 35% to the front. The rear brakes are $17\frac{1}{4}$ "x3" and the front 16"x2".

THE HAND BRAKE is located at the rear end of the transmission. The brake band is supported by a heavy

bracket attached to the end of the transmission case. The brake drum is securely riveted to the universal joint flange. The brake is of the external contracting band type. It is $8\frac{1}{2}$ " in diameter and 4" wide. The brake lining is $\frac{1}{4}$ " thick and will wear for a long time. A thumb nut adjustment provides means for tightening up the band as the lining wears down. The Hand Brake should be used only for parking purposes and in an emergency. The foot pedal, which operates the Bendix Brakes on all four wheels, should be used for all ordinary braking purposes.

THE STEERING GEAR is the Ross Cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is $1\frac{3}{4}$ " diameter, is made of seamless steel tubing and finished with baked black enamel. The steering wheel is 18" diameter and made up of laminated wood sections. The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is $1\frac{1}{8}$ " diameter, hardened and ground to size. The spark and throttle controls and the horn button are mounted in the center of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

THE FRAME is made of .20-.25 carbon open hearth steel, carefully selected and tested. Samples showing excess phosphorus or sulphur content are rejected.

The side rails are tapered from the front to rear and are $7\frac{1}{2}$ " deep at the center section. The upper flange is $2\frac{3}{4}$ " wide. The lower flange is $2\frac{1}{4}$ " wide. The thickness of the steel in the side rails is $\frac{7}{32}$ ". Three cross members with heavy gussets are hot riveted to the side rails. The overall width of the frame from front to rear is 32". The length varies with the wheelbase.

THE SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated.

The front springs are $38\frac{1}{2}$ " long by $2\frac{1}{4}$ " wide. The rear springs are 50" long by 3" wide. Front spring pins are $\frac{3}{4}$ " diameter and $1\frac{1}{4}$ " diameter on the rear springs. Special underslung rear springs can be furnished at extra cost. They carry the same load as the regular springs but are easier riding. These springs are 60" long and 3" wide. Helper springs are furnished on the standard overhung springs.

THE RADIATOR is a tubular type with cast tanks and cast side members.

The core has four sets of flat, copper tubes arranged one tube behind the other. The tubes are surrounded by thin, irregular, horizontal copper fins. The upper and lower ends of the tubes are held in perforated brass header plates which are bolted to their respective top and bottom tanks. This makes an extremely strong and rugged type of radiator, free from leaks and cracks, and very little affected by weather. The bottom tank is malleable iron, the side members are malleable iron and the top tank polished aluminum. The radiator core is about $3\frac{1}{2}$ " thick, has a frontal area of 390 square inches and the cooling system holds about $5\frac{1}{2}$ gallons of water.

Side lamp brackets for the headlights are attached to the radiator on each side.

THE THERMOSTAT regulates the temperature of the water in the motor. It is inserted in the water manifold on top of the cylinder head between the motor and the radiator. When the water is cold the thermostat valve is closed. This cuts off the water circulation until the water in the motor becomes hot at which time the thermostat valve commences to open and again allows water circulation. At about 175 degrees temperature the valve is full open in which position it will stay until the water again commences to cool off when it will automatically close.

THE STORAGE BATTERY is a six volt type, 126 ampere hour capacity. It has a molded hard rubber case and is mounted in a watertight box on the left hand running board. The battery is held by means of two clamp bolts in such a way that no strain is put on the case. The battery is easily removable.

THE WHEELS are the malleable steel type with six spokes, both front and rear. The spokes are hollow and the wheels very strong although they are but very little heavier than ordinary wood wheels.

THE TIRES are standard. Front 32" x 6" Pneu.; rear 32" x 6" Pneu. dual 8 ply. Special Front 32" x 6" Pneu.; rear 32" x 6" dual pneu. 10 ply at special price.

THE GASOLINE TANK is located on the side of the frame. The capacity is 31 gallons. The tank is constructed of No. 20 gauge terne plate. The header plates are stamped dished section and fastened in place by a lapped and rolled seam joint which is also soldered.

The tank has a drain plug at the bottom and a gasoline gauge. Stewart vacuum system is used.

HEADLIGHTS are the new type having controllable beam. The large bulb has double filaments and produces the high or long distance light for country work on the lower filament, while the upper filament produces a short flood light for city driving. An additional bulb with single filament furnishes parking lights.

The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell and rim are chrome finish.

The lens comply with all state requirements.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing points and a high pressure Alemite grease gun furnished with each truck as standard equipment.

PAINT. All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.

MODEL 32X—2½ TON**Specifications**

Rated Capacity - -	5000 lbs.
Wheel Base - - -	165" Standard; 148" Optional. Special at extra cost 176", 190" and 220".
Track - - - - -	Front 60¾". Rear or dual pneu., 72⅛".
Tires - - - - -	Standard 32"x6" pneu., 8 ply front; 32"x6" dual pneu., 8 ply rear. Special at extra cost 32"x6" 10 ply front and 32"x6" 10 ply dual rear, or 34"x7" front and 34"x7" dual rear.
Chassis Weight - -	5100 pounds.
Body Length - - -	10 ft. to 17 ft., depending on wheel base.
Engine - - - - -	Six cylinder, size 3⅝"x4½". Piston displacement, 278 cu. in. Horse Power 31.54 S.A.E. Actual Horse Power, 80 at 2500 R.P.M. Maximum Torque 182 ft. lbs. Cooling—Centrifugal pump. Carburetor — Stromberg. S.A.E. 1½" flange.
Rear Axle Ratio - -	Standard 7⅛:1. Special ratio at extra cost 6⅜:1.
Transmission - - -	Standard four speed. Low, 6.5:1; Second, 3.7:1; Third, 1.9:1; High, 1:1; Reverse, 7.8:1.
Turning Radius - -	28 ft. on standard wheelbase and tires.
Brakes - - - - -	Foot brakes, Bendix Duo-Servo, four wheel mechanical size front 16"x2"; rear 17¼"x3". Hand brake on transmission 9"x5".

- Gasoline Tank - - Located on side of frame. Capacity 31 gal. Stewart vacuum system with booster. Gasoline gauge.
- Frame - - - - - Depth, 7½"; flange width, 2¾"; steel, ¼" thick. Heat treated.
- Front Springs - - - 38½" long, 2¼" wide, 11 leaves.
- Rear Springs - - - Length 50", width 3", 14 leaves in the main spring and 6 leaves in the helper.
- Radius Rods - - - Standard equipment on all chassis with standard overhung springs.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric horn and battery; vacuum tank with booster and gas filter; tool kit, jack, rear tire carrier, spare rim, speedometer, windshield wiper and mirror on all bodies and cabs. Carburetor air cleaner, thermostat, gasoline gauge, stop light, and Alemite grease gun. The instrument board is equipped with ammeter, oil gauge, starting choke button, lighting and ignition switches and indirect dash light.

Model 32X Mechanical Description

MODEL 32X ENGINE—6 CYLINDER: This engine is the vertical "L" head type, built for heavy duty truck work. The base of the engine is 3⅝", the stroke 4½". It develops 80 horsepower at 2500 R.P.M. and 182 ft. lbs. of torque at 1100 R.P.M. The piston displacement is 278 cu. in.

The cylinders and the crank case are cast in one unit. The cylinder head is removable. There are large water spaces around the cylinders and valves and over the combustion chambers. The flywheel housing is machined for standard No. 3 S.A.E. transmission mounting.

The oil pan is easily removable, which allows complete access to all crankshaft and rod bearings and to the oil pump.

The intake and exhaust manifolds are the Swan type with a hot spot to assist in vaporizing the fuel.

THE OILING SYSTEM is the full pressure type, and is maintained by a gear pump driven by spiral gears from the cam shaft. The oil, under pressure, is led to the main connecting rod and cam shaft bearings thru drilled passages. An oil pressure regulator keeps the oil under constant pressure at all motor speeds. The cylinder walls and pistons are lubricated by oil thrown from the connecting rods.

THE CRANKSHAFT is 2 $\frac{5}{8}$ " diameter and has four main bearings. It is drop forged from .40-.50 open hearth steel, double heat treated, machined and ground to size, hollow drilled for oil feeds and then balanced on a special crankshaft balancing machine at high speeds. The rear end of the crankshaft forging has a heavy flange to which the flywheel is bolted. All main bearings are bronze backed and babbit lined.

The main crankshaft bearings are as follows:

Size	of	front	crankshaft	bearing,	2 $\frac{5}{8}$ "x1 $\frac{11}{16}$ "
"	"	2nd	"	"	2 $\frac{5}{8}$ "x2 $\frac{1}{8}$ "
"	"	3rd	"	"	2 $\frac{5}{8}$ "x2 $\frac{1}{16}$ "
"	"	4th	"	"	2 $\frac{5}{8}$ "x2 $\frac{5}{16}$ "

THE CAM SHAFT is drop forged from .20 carbon steel. All cams and bearings are forged integral, heat treated, machined and ground to size. All cams are tested with the scleroscope for a required degree of hardness. The cam shaft is supported by five bearings of the following sizes:

Size	of	front	cam	shaft	bearing,	2.03"x2"
"	"	2nd	"	"	"	2.00"x1"
"	"	3rd	"	"	"	1.99"x1"
"	"	4th	"	"	"	1.95"x1"
"	"	5th	"	"	"	1.94"x1 $\frac{3}{8}$ "

THE CONNECTING RODS are drop forged. They have "I" beam section and are double heat treated. They are 9" long from center to center. The large

connecting rod bearings are pressure cast directly into the rod by a centrifugal process which insures the proper density of the metal. The upper end is clamped to the piston pin. The crankshaft end is $2\frac{11}{32}$ " in diameter and $1\frac{11}{16}$ " long.

THE VALVES are entirely enclosed and the valve chamber is flooded with oil from the motor base. There are two valve cover plates, made of pressed steel. When these plates are removed the valves are easy to reach for adjustment.

The exhaust valves are made of Silchrome steel especially designed to resist the high temperature of the exhaust gases. The inlet valves are made of nickel steel. The exhaust valves are $1\frac{5}{8}$ " diameter and the inlet valves $1\frac{3}{4}$ " diameter. All valves have a lift of $\frac{5}{16}$ ". Seat angle is 30° for both valves.

The valve lifters are the standard mushroom type carefully hardened and ground. They are flooded with oil from the crank case. Screwed into the stem of the valve lifter is an adjusting screw with a special hardened head, held in position with a lock nut. The valves are adjusted by means of this screw.

THE WATER PUMP is located at the front end of the cylinder block at the top and is driven, together with the radiator fan by a V rubber belt from a pulley on the crank shaft. The pump is of the centrifugal type and the shaft is mounted on a roller bearing and provided with suitable stuffing box to prevent water leakage.

THE RADIATOR FAN is mounted on the front end of the pump shaft and is driven by the V shape rubber belt which also drives the water pump. The upper fan belt pulley is adjustable for the purpose of taking up slack in the belt. The fan has four pressed steel blades which are 20" in diameter. The rotation looking at the front end of the motor is clockwise. The drive pulley is 6"

in diameter and the fan pulley 4¾" in diameter. The V belt is 7/8" wide with 38 degrees included angle.

THE FLYWHEEL is attached to the crankshaft flange with six bolts. These are dimensioned bolts and the holes are reamed to size. The flywheel is made of cast iron and a steel ring gear with teeth for the starter is pressed on. The flywheel is machined for multiple disc dry plate clutch and is carefully balanced to prevent vibration.

THE PISTONS are made of special fine gray cast iron. They are 3⅝" in diameter and 4¼" long. They have four piston rings at the top of the piston. The piston rings are 3/16" wide. The three top rings are plain cast iron. The lower ring is a special oil wiper ring. All pistons are weighed and held within close limits.

THE SPARK PLUGS are located in the top of the cylinder head. They are S.A.E. Metric plugs.

THE LIGHTING GENERATOR is a Delco-Remy unit delivering a six volt current. It is attached to the motor on the right hand side at the front by standard S.A.E. Flange on the gear case housing and is driven by the front timing gears. The generator rotates at 1 5/27 times crank shaft speed. Rotation looking at the driving end of the generator is clockwise.

THE DISTRIBUTOR is mounted on the top of the cylinder head and driven by means of a set of spiral gears. The rotation, looking down on the distributor, is counter clockwise.

THE STARTING MOTOR is mounted on the left hand side of the motor at the rear. It is attached to the front face of the flywheel housing by S.A.E. flange type mounting. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

THE STANDARD IGNITION is a battery but a magneto equipped unit can be furnished on special order.

THE TRANSMISSION is a four speed, unit power plant type which bolts directly to the flywheel housing of the motor. The transmission gears have a $\frac{7}{8}$ " width of face and are cut 6-8 and 5-7 pitch which produces exceptionally strong teeth. After the gears are cut they are first carbonized and then given a double heat treatment which produces maximum hardness on the gear tooth surface and maximum toughness inside. They are made from 3½% nickel steel.

The main transmission shaft is $1\frac{13}{16}$ " diameter and has 10 large splines which drive the gears. These shafts are made of 3½% nickel steel, carefully heat treated and ground to size. The transmission shaft end is finished $1\frac{1}{2}$ " S.A.E. taper.

Annular ball bearings are used on the main shaft and on the countershaft. The main shaft front bearing is No. 308. Main shaft rear bearing is No. 308. Front countershaft bearing No. 306 and rear No. 306. Spline shaft pilot bearing is No. 305.

The transmission gear ratios are arranged as follows: Low, 6.5-1; Second, 3.7-1; Third, 1.9-1; High, 1-1; Reverse, 7.8-1.

The rear axle ratio is $7\frac{1}{8}$ to 1. Therefore the total gear reductions from motor to rear axle are as follows: Low, 46.3:1; Second, 26.4:1; Third, 13.5:1; High, $7\frac{1}{8}$:1; Reverse, 55.6:1.

THE CLUTCH is the dry plate, multiple disc type which consists of one set of plain steel plates and another set of steel discs, lined on both sides with asbestos fabric facings. The steel plates are $\frac{1}{16}$ " thick, made from saw blade steel and properly hardened. The outside edges of the asbestos covered clutch discs are cut with small gear teeth which fit with similar teeth cut in the inside face of the clutch driving drum. This method of construction provides large wearing surfaces and prevents noise. The clutch drum is bolted to the flywheel in such

a way as to prevent the possibility of its becoming loose. There are a total of 13 plates in the clutch, 7 double faced plates and 6 plain steel plates together with the two header plates. The plates are all 8" outside diameter and 6" inside diameter, which gives a total clutch area of 310 square inches.

The clutch spring is made of a single coil of rectangular spring steel, calibrated to give the exact desired compression.

The clutch shaft is 1 ⅜" in diameter, made from 3½% nickel steel, heat treated and ground to size. It is piloted into the flywheel with a No. 205 annular ball bearing which is provided with a grease retaining ring.

The clutch release trunnion is equipped with a specially designed ball thrust bearing, which is provided with a grease retaining ring. Both the pilot and clutch throw-out bearings have positive means of lubrication.

THE FRONT AXLE is the reverse Elliot type, with a drop forged, heat treated "I" beam of open hearth steel. The beam is 2¼" wide by 2⅝" deep. The spring pads are forged integral with the beam. The wheel spindles are made of nickel steel and heat treated. They are 1½" diameter at the outside and 2" diameter at the inside.

The king pin is 1⅛" diameter, made of nickel steel, heat treated and ground. A Timken roller bearing No. 1215-1 is located in each spindle yoke to take the thrust and insure easy steering.

The steering ball on the axle arm is 1¼" diameter. The steering cross rod is solid and is equipped at each end with special ball socket joints, which eliminate any possibility of the axle cramping while turning. The cross rod is ⅞" in diameter.

The wheel bearings are Timken taper roller bearings. The outside bearings are No. 414-No. 418, the inside bearings are No. 522-No. 529.

The axle tread is 60¾".

THE REAR AXLE is a full floating spiral bevel gear type. The axle housing is cast steel of the banjo type. The rear axle cover plate is a pressed steel part.

The spiral bevel gear is made of 3½% nickel steel and the pinion of 5% nickel steel. The teeth are carbonized and hardened to give maximum strength. The tooth face is 1¾".

The standard gear ratio is 7⅛:1. Special ratio at extra cost is 6⅜:1.

The differential is the four pinion type and is mounted on two Timken taper roller bearings, Nos. 567-563 which are easily adjusted after the rear axle cover plate has been removed.

The pinion shaft is straddle mounted, having a double row Timkin taper roller bearing, No. 53176-No. 53387 in front, and a single row anular ball bearing, No. 1406 in the rear. The pinion shaft end is finished standard 1½" S.A.E. taper.

The full floating axle shafts are made of high carbon nickel steel. They are 1½" in diameter, the full length except at the ends which are slightly larger where the spines are cut in.

The wheel bearings are mounted on a seamless steel tube reinforcing sleeve, 3" in diameter, which extends far into the axle housing.

There are two Timken taper roller bearings No. 575-No. 572 on each rear wheel. The rear axle tread is 72⅛" with dual tires.

THE DRIVE SHAFT is made of high carbon seamless steel tubing 2¼" in diameter. This tubing is carefully selected and tested for true running balance at high speeds. The tube walls are .109" thick and uniform.

The spicer universal joints are tightly enclosed in pressed steel cases which retain the lubricant and keep out the dirt. The cases are provided with adjustable locks to hold them tightly in position. The yokes of the joints are made of molybdenum steel, heat treated and ground to size. All pins and bushings are also of steel and are hardened and ground to accurate dimensions so that all parts are interchangeable. This drive shaft assembly has three joints with a centre support. The centre support consists of a malleable iron housing which holds a S.K.F. self aligning ball bearing and is

bolted to the centre cross member of the frame by means of a flat steel support.

THE FOOT BRAKES are the Bendix Duo-Servo four wheel brakes. They are the self energizing type brake which has a very powerful action without excessive foot pressure. They are all internal expanding and are entirely enclosed, both front and rear, and are mechanically operated by the foot pedal. The braking effort is so distributed that 65% goes to the rear wheels and 35% to the front. The rear brakes are 17¼"x3" and the front 16"x2".

THE HAND BRAKE is located at the rear end of the transmission. The brake band is supported by a heavy bracket attached to the end of the transmission case. The brake drum is securely riveted to the universal joint flange. The brake is of the external contracting band type. It is 9" in diameter and 5" wide. The brake lining is ¼" thick, and will wear for a long time. A thumb nut adjustment provides means for tightening up the band as the lining wears down. The Hand Brake should be used only for parking purposes and in an emergency. The foot pedal which operates the Bendix Brakes, on all four wheels, should be used for all ordinary braking purposes.

THE STEERING GEAR is the Ross Cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is 1¾" diameter, is made of seamless steel tubing and finished with baked black enamel. The steering wheel is 18" in diameter and made up of laminated wood sections. The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is 1¼" diameter, hardened and ground to size. The spark and throttle controls and the horn button are mounted in the centre of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

THE FRAME is made of .20-.25 carbon, open hearth steel carefully selected and tested, and heat treated. Samples showing excess phosphorus or sulphur content are rejected.

The side rails are tapered from front to rear and are 7½" deep at the centre section. The flanges are 2¾" wide on top and 2¼" wide at bottom. The thickness of the steel in the side rails is ¼". Three cross members with heavy gussets are hot riveted to the side rails. The overall width of the frame from front to rear is 32". The length varies with the wheelbase.

THE SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated. Rear springs are built with auxiliary helpers on top.

The front springs are 40" long by 3" wide. The rear springs are 56" long by 3" wide. All front spring pins are ¾" diameter and 1¼" diameter on the rear springs. Special underslung rear springs can be furnished at extra cost. They carry the same load as the regular springs but are easier riding. These springs are 60" long and 3" wide. Helper springs are furnished on the standard overhung springs.

THE RADIATOR is a chrome finished heavy pressed steel shell type. The upper and lower tanks and the tubular core are made in one unit and supported on the front cross member together with the shell. The core unit is also suspended in the shell by means of side supports bolted to the shell. The radiator has a frontal area of 448 square inches. The core has four sets of flat copper tubes arranged one tube behind the other. The tubes are surrounded by thin, irregular, horizontal copper cooling fins. The cooling system holds about 5 gallons of water.

THE THERMOSTAT regulates the temperature of the water in the motor. It is inserted in the water manifold on top of the cylinder head between the motor and the radiator. When the water is cold the thermostat valve is closed. This cuts off the water circulation until the

water in the motor becomes hot, at which time the thermostat valve commences to open and again allows water circulation. At about 175 degrees temperature, the valve is full open in which position it will stay until the water again commences to cool off when it will automatically close.

THE STORAGE BATTERY is a six volt type, 126 ampere hour capacity. It has a molded, hard rubber case and is mounted in a water tight box on the left hand running board. The battery is held by means of two clamp bolts, in such a way that no strain is put on the case. The battery is easily removable.

THE WHEELS are the malleable steel type with six spokes both front and rear. The spokes are hollow and the wheels very strong although they are but very little heavier than ordinary wood wheels.

THE TIRES are, Standard 32"x6" front, 8 ply, 32"x6" dual rear, 8 ply. Special at extra cost, 32"x6" front, 10 ply, 32"x6" dual rear, 10 ply, or 34"x7" front and 34"x7" dual rear.

THE GASOLINE TANK is located on the side of the frame. The capacity is 31 gallons. The tank is constructed of 20 gauge terne plate. The header plates are stamped dished section and fastened in place by a lapped and rolled seam joint which is also soldered. Gasoline is fed to the carburetor by vacuum tank. The tank has a drain plug at the bottom and gasoline gauge.

HEADLIGHTS are the new type having controllable beam. The large bulb has double filaments and produces the high or long distance light for country work on the lower filament, while the upper filament produces a short flood light for city driving. An additional bulb with single filament furnishes parking lights.

The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell and rim are chrome finish.
The lens comply with all state requirements.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing points and a high pressure Alemite grease gun furnished with each truck as standard equipment.

PAINT: All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.

MODEL 18X—2½ TON**Specifications**

Rated Capacity - -	5000 pounds.
Wheel Base - - - -	Standard 165"; Special 148", 176", 190" and 220".
Track - - - - -	Front 64⅜"; Rear Dual Pneu. 66½".
Tire Equipment - -	Front 32" x 6" Pneu.; Rear 32" x 6" Pneu. Dual, 10 ply. Optional Solid. Front 36" x 4"; Rear 36" x 8". Extra Cost Front 34" x 7" Pneu.; Rear 34" x 7" Pneu. Dual, Heavy Duty. Extra Cost Front 34" x 7" Pneu.; Rear 36" x 8" Single, Heavy Duty.
Chassis Weight - -	5806 pounds, Standard Wheelbase 165".
Body Length - - -	From 10 ft. to 17 ft., depending on wheel base.
Engine - - - - -	Six cylinder, size 3⅝"x5". Piston displacement 310 cu. in. Horse Power 31.54 S.A.E. Actual 85 at 2750 R.P.M. Maximum Torque 195 ft. pounds. Cooling—Centrifugal pump. Carburetor — Stromberg. S. A. E. 1½" flange. Counterbalanced crankshaft.
Rear Axle Ratio - -	Standard 7½:1; Special 9¼:1 and 6 1/5:1 at extra cost. Worm gear.
Transmission - - -	Standard four speed. Low, 6.5-1; Second, 3.7-1; Third, 1.9-1; High, 1-1; Reverse, 7.8-1.
Turning Radius - -	28 feet for 165" wheelbase and standard tires.

- Brakes - - - - - Foot brakes, Bendix Duo-Servo four wheel, mechanical, size Front 16"x 2½"; rear 17¼"x4". Hand brake on transmission size 9"x5".
- Gasoline Tank - - - Located on side of frame. Capacity 31 gallons.
Stewart vacuum system with booster. Gasoline gauge.
- Frame - - - - - Depth 7½", width 2¾", steel ¼" thick. Heat treated.
- Front Springs - - - Size 40" long, 3" wide, 11 leaves.
- Rear Springs - - - Size 56" long, 3" wide, 15 leaves in main spring and 6 leaves in helper. Special rear underslung springs, 60" long and 3" wide for easy riding without radius rods. Helper springs are furnished standard on overhung springs.
- Radius Rods - - - Standard equipment on all chassis with standard overhung springs with helpers.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric horn and battery; vacuum tank with booster and gas filter; tool kit, jack, rear tire carrier, spare rim, speedometer, windshield wiper and mirror on all bodies and cabs. Carburetor air cleaner, thermostat, gasoline gauge, stop light, and Alemite grease gun. The instrument board is equipped with ammeter, oil gauge, starting choke button, lighting and ignition switches and indirect dash light.

Model 18-X—Mechanical Descriptions

MODEL 18-X MOTOR—6 CYLINDER: This motor has six cylinders, cast enbloc, vertical "L" head type, with detachable cylinder block and detachable cylinder head. The cylinders are made of a special close grained, gray iron. There are large water spaces around the cylinders and valves and over the combustion chambers.

The motor size is 3 $\frac{5}{8}$ " bore by 5" stroke and actually develops 75 H.P. at 2750 R.P.M. The motor is designed for three point suspension.

The crank case is made of cast iron and is strongly ribbed to prevent distortion at any point. Four heavy ribs are cast in the base to support the four crankshaft bearings. The crank case is machined for standard No. 3 S.A.E. transmission mounting.

The oil pan is easily removable, which allows complete access to all crank shaft and rod bearings and to the oil pump.

The intake and exhaust manifolds are of the Swan type with a hot spot to assist in vaporizing the fuel.

The crank shaft is of the counter balanced type to reduce vibration to a minimum.

The bell housing which encloses the flywheel is so constructed that the lower half may be removed.

THE OILING SYSTEM is a full force feed, pressure system. Pressure is maintained by means of a submerged gear pump located in the centre of the motor base. The pump is driven by means of a set of spiral gears from the cam shaft. The crank shaft is hollow drilled to distribute oil to the main bearings. The connecting rods are rifle drilled to conduct oil to the piston pins.

The entire oiling system is contained in the upper half of the motor base. The oil pressure is controlled by a regulator valve located on the carburetor side of the motor.

The oil pressure is controlled by a regulator valve to give constant pressure at all engine speeds. Piston and cylinders are lubricated by oil thrown from the upper and lower ends of the connecting rods. Timing gears are fed positively from the oiling system.

THE CRANKSHAFT has four main bearings and is 2¾" diameter. It is drop forged from .40-.50 open hearth steel, double heat treated, machined, ground to size, hollow drilled for oil feeds and then balanced on a special crankshaft balancing machine at high speeds. The crankshaft is counter balanced with the weights welded in position. The main crankshaft bearings are as follows:

Size of front	crank shaft bearing,	2¾"x2¾"
" " second	" " "	2¾"x2¼"
" " third	" " "	2¾"x2¼"
" " rear	" " "	2¾"x2¾"

The rear end of the crank shaft forging has a heavy flange to which the flywheel is bolted. All main bearings are bronze backed and babbit lined.

THE CAM SHAFT is drop forged from .20 carbon steel. All cams and bearings are forged integral, heat treated, machined and ground to size. All cams are tested with the scleroscope for a required degree of hardness. The cam shaft is 1⅛" diameter and is supported on five bearings.

Size of front	cam shaft bearing,	2.04x2⅛"
" " second	" " "	2.01x1"
" " third	" " "	1.990x1"
" " fourth	" " "	1.96x1"
" " rear	" " "	1.94x1½"

THE CONNECTING RODS are drop forged from .30-.40 open hearth carbon steel. They have the "I" beam section and are double heat treated. They are 10¾" long from centre to centre. The connecting rods are rifle drilled to permit the passage of oil from the crank shaft to the piston pin bearings. The large connecting rod bearings are pressure cast directly into the large end of the connecting rod by a centrifugal process which ensures the proper density of the metal. The upper connecting rod ends are bushed with bronze. The lower connecting rod bearings are 2½"x1⅝". The upper bronze bushings are 1⅛"x1⅜".

THE VALVES are entirely enclosed and the valve chamber is flooded with oil from the motor base. There are two valve cover plates, made of pressed steel. When these plates are removed the valves are easy to reach for adjustment.

The exhaust valves are made of Silchrome steel especially designed to resist the high temperature of the exhaust valves. The inlet valves are made of nickel steel. The exhaust valves are $1\frac{11}{16}$ " diameter and the inlet valves $1\frac{13}{16}$ " diameter. All valves have a lift of $\frac{5}{16}$ ". Seat angle is 45° for both valves.

The valve lifters are the standard mushroom type carefully hardened and ground. They are flooded with oil from the crank case. Screwed into the stem of the valve lifter is an adjusting screw with a special hardened head, held in position with a lock nut. The valves are adjusted by means of this screw.

THE WATER PUMP is located at the front end of the cylinder block at the top and is driven, together with the radiator fan by a V rubber belt from a pulley on the crank shaft. The pump is of the centrifugal type and the shaft is mounted on a roller bearing and provided with suitable stuffing box to prevent water leakage.

THE RADIATOR FAN is mounted on the front end of the pump shaft and is driven by the V shape rubber belt which also drives the water pump. The upper fan belt pulley is adjustable for the urpose of taking up slack in the belt. The fan has four pressed steel blades which are 20" in diameter. The rotation looking at the front end of the motor is clockwise. The drive pulley is 6" in diameter and the fan pulley $4\frac{3}{4}$ " in diameter. The V belt is $\frac{7}{8}$ " wide with 38 degrees included angle.

THE FLYWHEEL is attached to the crankshaft flange with six bolts. These are dimensioned bolts and the holes are reamed for size. The flywheel is made of cast iron and a steel ring gear with teeth for the starter is pressed on. The flywheel is machined for multiple disc dry plate clutch and is carefully balanced to prevent vibration.

THE PISTONS are made of a special fine gray cast iron. They are $3\frac{5}{8}$ " diameter and $4\frac{3}{8}$ " long. They have four piston rings at the top of the piston. The piston rings are $\frac{3}{16}$ " wide. The three top rings are plain cast iron. The lower ring is a special oil wiper ring. All pistons are weighed and held within close limits.

THE SPARK PLUGS are located in the top of the cylinder head. They are $\frac{7}{8}$ " 18 U.S.F. thread.

THE LIGHTING GENERATOR is a Delco-Remy unit delivering a six volt current. It is attached to the motor on the right hand side at the front by standard S.A.E. Flange on the gear case housing and is driven by the front timing gears. The generator rotates at $1\frac{1}{2}$ times crank shaft speed. Rotation looking at the driving end of the generator is clockwise.

THE DISTRIBUTOR is mounted on the top of the cylinder head and driven by means of a set of spiral gears. The rotation, looking down on the distributor, is clockwise.

THE STARTING MOTOR is mounted on the right hand side of the motor at the rear. It is attached to the front face of the flywheel housing by S.A.E. flange type mounting. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

THE STANDARD IGNITION is a battery but a magneto equipped unit can be furnished on special order.

THE TRANSMISSION is a four speed, unit power plant type which bolts directly to the flywheel housing of the motor. The transmission gears have a $\frac{3}{4}$ " width of face and are cut 6-8 and 5-7 pitch which produces exceptionally strong teeth. After the gears are cut they are first carbonized and then given a double heat treatment which produces maximum hardness on the gear tooth surface and maximum toughness inside. They are made from $3\frac{1}{2}\%$ nickel steel.

The main transmission shaft is $1\frac{13}{16}$ " diameter and has 10 large splines which drive the gears. These shafts are

made of 3½% nickel steel, carefully heat treated and ground to size. The transmission shaft end is finished 1½" S.A.E. taper.

Annular ball bearings are used on the main shaft and on the countershaft. The main shaft front bearing is No. 308. Main shaft rear bearing is No. 308. Front countershaft bearing No. 306 and rear No. 306. Spline shaft pilot bearing is No. 305.

The transmission gear ratios are arranged as follows: Low, 6.5-1; Second, 3.7-1; Third, 1.9-1; High, 1-1; Reverse, 7.8-1.

The rear axle ratio is 7½ to 1. Therefore the total gear reductions from motor to rear axle are as follows: Low, 48.7-1; Second, 27.8-1; Third, 14.25-1; High, 7½-1; Reverse, 59.3-1.

THE CLUTCH is the dry plate, multiple disc type which consists of one set of plain steel plates and another set of steel discs, lined on both sides with asbestos fabric facing. The steel plates are $\frac{1}{16}$ " thick, made from saw blade steel and properly hardened. The outside edges of the asbestos covered clutch discs are cut with small gear teeth which fit with similar teeth cut in the inside face of the clutch driving drum. This method of construction provides large wearing surfaces and prevents noise. The clutch drum is bolted to the flywheel in such a way as to prevent the possibility of its becoming loose. There are a total of 13 plates in the clutch, 7 double faced plates and 6 plain steel plates together with the two header plates. The plates are all 8" outside diameter and 6" inside diameter, which gives a total clutch area of 310 square inches.

The clutch spring is made of a single coil of rectangular spring steel, calibrated to give the exact desired compression.

The clutch shaft is 1 $\frac{3}{8}$ " in diameter, made from 3½% nickel steel, heat treated and ground to size. It is piloted into the flywheel with a No. 205 annular ball bearing which is provided with a grease retaining ring.

The clutch release trunnion is equipped with a specially designed ball thrust bearing, which is provided with a grease retaining ring. Both the pilot and clutch throw-out bearings have positive means of lubrications.

THE FRONT AXLE is the reverse Elliott type, with a drop forged, heat treated "I" beam of open hearth steel. The beam is 2¼" wide, 7⅞" deep. The spring pads are forged integral with the beam.

The wheel spindles are made of nickel steel and heat treated. They are 1¾" diameter at the inside bearing and 1¼" diameter at the outside bearing. The pivot bolt is 1" diameter, made of nickel steel, heat treated and ground. A Timken roller bearing No. T-102 is located in each spindle yoke head for the purpose of insuring easy steering. The steering ball on the axle arm is 1½" diameter. The steering cross rod is a seamless steel tube 1¼" in diameter, and is equipped at each end with special ball and socket joint, which eliminates any possibility of the front axle cramping while turning.

The wheel bearings are the latest type Timken roller and are adjustable. The inside wheel bearing is Timken No. 4370-4320, and the outside is Timken No. 3193-3120. The front axle tread is 64⅜".

THE REAR AXLE is a Timken, full floating, overhead worm drive type. The axle housing is cast steel with walls $\frac{7}{16}$ " thick. The axle housing is reinforced with nickel steel wheel bearing sleeves.

The worm is made of a special electric furnace molybdenum steel, carbonized and hardened, with the worm thread ground to extreme accuracy for lead and index thread. The worm shaft is mounted on two Timken roller bearings, No. 53387-53162 at the rear end and a Hyatt roller bearing No. RA-407 at the front end. These two Timken bearings at the rear are placed back to back so that the worm thrust, in both direction, is taken on these two bearings. The worm front end is finished with S.A.E. 1½" standard taper.

The worm wheel is made from Timken Special Processed Nickle bronze. The teeth in the worm wheel

are cut with the greatest accuracy. A new form of worm gear tooth has recently been developed which gives these gears about five times the life of previous type gears. The worm wheel is securely riveted to a large, four pinion, block type differential. The differential is mounted on two Timken taper roller bearings, No. 473-477 which are readily adjustable. The standard gear ratio is $7\frac{1}{2}$ -1 and special ratios can be furnished as follows: $6\frac{1}{5}$ -1; and $9\frac{1}{4}$ -1 at extra cost.

The full floating axle shafts are made of nickel chromium, alloy steel and are $1\frac{13}{16}$ " in diameter at the smallest place. The inner ends are splined while the outer ends have upset driving flanges forged integral with the shaft.

The wheel bearings are mounted on the nickel steel, reinforcing wheel spindles which are $2\frac{3}{4}$ " in diameter and made from $\frac{3}{8}$ " stock. This spindle reinforces the axle housing way in, close to the differential. Each wheel has two Timken roller bearings No. 5520-5557. The rear axle tread is approximately $66\frac{1}{2}$ " with dual tires.

THE DRIVE SHAFT is made of high carbon seamless steel tubing $2\frac{1}{4}$ " in diameter. This tubing is carefully selected and tested for true running balance at high speeds. The tube walls are .120" thick and uniform.

The Spicer universal joints are tightly enclosed in pressed steel cases which retain the lubricant and keep out the dirt. The cases are provided with adjustable locks to hold them tightly in position. The yokes of the joints are made of molybdenum steel, heat treated and ground to size. All pins and bushings are also of steel and are hardened and ground to accurate dimensions so that all parts are interchangeable. This drive shaft assembly has three joints with a centre support. The centre support consists of a malleable iron housing which holds a S.K.F. self-aligning ball bearings is bolted on the centre cross member of the frame, by means of a flat steel support.

THE FOOT BRAKES are the Bendix Duo-Serio four wheel brakes. They are the self energizing type brake which has a very powerful action without excessive foot

pressure. They are all internal expanding and are entirely enclosed, both front and rear, and are mechanically operated by the foot pedal. The braking effort is so distributed that 65% goes to the rear wheels and 35% to the front. The rear brakes are 17¼"x4" and the front 16"x2½".

THE HAND BRAKE is located at the rear end of the transmission. The brake band is supported by a heavy bracket attached to the end of the transmission case. The brake drum is securely riveted to the universal joint flange. The brake is of the external contracting band type. It is 9" in diameter and 5" wide. The brake lining is ¼" thick, and will wear for a long time. A thumb nut adjustment provides means for tightening up the band as the lining wears down. The Hand Brake should be used only for parking purposes and in an emergency. The foot pedal which operates the Bendix Brakes, on all four wheels, should be used for all ordinary braking purposes.

THE STEERING GEAR is the Ross Cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is 1¾" diameter, is made of seamless steel tubing and finished with baked black enamel. The steering wheel is 18" in diameter and made up of laminated wood sections. The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is 1½" diameter, hardened and ground to size. The spark and throttle controls and the horn button are mounted in the centre of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

THE FRAME is made of .20-.25 carbon open hearth steel, carefully selected, tested and heat treated. Samples showing excess phosphorus or sulphur content are rejected.

The side rails are tapered from front to rear and are 7½" deep at the centre section. The flanges are 2¾" wide on top and 2¼" wide at bottom. The thickness of the steel in the side rails is ¼". Four cross members with heavy gussets are hot riveted to the side rails. The overall width of the frame from front to rear is 32". The length varies with the wheelbase.

THE SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated. Rear springs are built with auxiliary helpers on top.

The front springs are 40" long by 3" wide. The rear springs are 56" long by 3" wide. All front spring pins are 1" diameter and 1¼" diameter on the rear springs. Special underslung, rear springs can be furnished at extra cost. They carry the same load as the regular springs but are easier riding. These springs are 60" long and 3" wide. Helper springs are furnished on the standard overhung springs.

THE RADIATOR is a polished cast aluminum shell type. The upper and lower tanks and the tubular core are made in one unit and supported on the front cross member together with the shell. The core unit is also suspended in the shell by means of side supports bolted to the shell. The radiator has a frontal area of 473 square inches. The core has four sets of flat, copper tubes arranged one tube behind the other. The tubes are surrounded by thin, irregular, horizontal copper cooling pins. The cooling system holds about 6 gallons of water.

Brackets for the headlights are attached to the radiator on each side.

THE THERMOSTAT regulates the temperature of the water in the motor. It is inserted in the water manifold on top of the cylinder head between the motor and the radiator. When the water is cold the thermostat valve is closed. This cuts off the water circulation until the water in the motor becomes hot, at which time the ther-

mostat valve commences to open and again allows water circulation. At about 175 degrees temperature, the valve is full open in which position it will stay until the water again commences to cool off when it will automatically close.

THE STORAGE BATTERY is a six volt type, 126 ampere hour capacity. It has a molded, hard rubber case and is mounted in a water tight box on the left hand running board. The battery is held by means of two clamp bolts, in such a way that no strain is put on the case. The battery is easily removable.

THE WHEELS are the malleable steel type with eight spokes both front and rear. The spokes are hollow and the wheels very strong although they are but very little heavier than ordinary wood wheels.

THE TIRES are, Front 32"x6x Pneu.; rear 32"x6" Pneu. dual, 10 ply. Extra cost, front 34"x7x Pneu.; rear 34"x7" Pneu. dual, heavy duty. Extra cost front 34"x7" Pneu.; rear 36"x8" Single, heavy duty. Solid 34"x4" front, 36"x8" rear.

THE GASOLINE TANK is located on the side of the frame. The capacity is 31 gallons. The tank is constructed of 20 gauge terne plate. The header plates are stamped dished section and fastened in place by a lapped and rolled seam joint which is also soldered. Gasoline is fed to the carburetor by vacuum tank. The tank has a drain plug at the bottom and gasoline gauge.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing points and a high pressure Alemite grease gun furnished with each truck as standard equipment.

HEADLIGHTS are the new type having controllable beam. The large bulb has double filament and produces the high or long distance light for country work

on the lower filament, while the upper filament produces a short flood light for city driving.

An additional bulb with single filament furnishes parking lights.

The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell and rim are chrome finish.

The lens comply with all state regulations.

PAINT: All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.

MODEL 33X—3 TON

Specifications

Rated Capacity	- -	6,000 pounds.
Wheel Bases	- - -	Standard 165", optional 147". Special at extra cost; 176", 190", 220" and 235".
Track	- - - - -	Front 64 $\frac{3}{8}$ ". Rear 65 $\frac{1}{2}$ ", with single solid; 67" with rear dual pneumatic.
Tires	- - - - -	Standard 34"x7" pneumatic front, 34"x7" dual pneumatic rear. Optional 8.25"-20" base balloons dual rear or 36"x5" solid front and 36"x10" single solid rear.
Chassis Weight	- -	6450 pounds with standard wheelbase and tires.
Body Length	- - -	10 feet to 20 feet depending on wheelbase.
Engine	- - - - -	Six Cylinder 3 $\frac{7}{8}$ " bore x 5" stroke. Piston displacement, 354 cu. in. Horse Power 36.04 S.A.E. Actual 90 H.P. at 2,750 R.P.M. Maximum torque, 224 ft. lbs. Cooling: Centrifugal water pump. Carburetor: Stromberg S.A.E. 1 $\frac{1}{2}$ " flange. Counterbalanced crankshaft.
Rear Axle Ratio	-	Standard 7 $\frac{1}{4}$ -1. Special at extra cost, 8 $\frac{1}{2}$ -1 or 6-1 worm gear.
Transmission	- - -	Standard 4 speed. Low 6.5-1, second 3.7-1, third 1.9-1, high 1-1, reverse 7.8-1. An auxiliary transmission can be furnished at extra cost.
Turning Radius	- -	28 feet for standard wheelbase and tires.

- Brakes - - - - - Foot brakes, four wheel Bendix Duo Servo. Front 16"x2½", rear 17¼"x4". Hand brake on rear of transmission, size 9"x5".
- Gasoline Tank - - Mounted on side of frame. Capacity, 31 gal. Stewart vacuum system with booster gasoline gauge.
- Frame - - - - - Depth 9", width of flange 2¾", steel ¼". Heat treated.
- Front Springs - - - 40" long, 3" wide, 12 leaves.
- Rear Springs - - - 56" long, 3" wide, 15 leaves in main spring and 6 leaves in helper.
- Radius Rods - - - Standard equipment.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric horn and battery; vacuum tank with booster and gas filter; tool kit, jack, rear tire carrier, spare rim, speedometer, windshield wiper and mirror on all bodies and cabs, carburetor air cleaner, thermostat, gasoline gauge, stop light, and Alemite grease gun. The instrument board is equipped with ammeter, oil gauge, starting choke button, lighting and ignition switches and indirect dash light.

MODEL 33X

Mechanical Description

MODEL 33X MOTOR—6 CYLINDER: This motor has six cylinders, cast enbloc, vertical "L" head type with detachable cylinder block and detachable cylinder head. The cylinders are made of a special close grained, gray iron. There are large water spaces around the cylinders and valves and over the combustion chambers.

The motor size is 3⅞" bore by 5" stroke and actually develops 90 H.P. at 2750 R.P.M. The motor is designed with counter balanced crankshaft.

The crank case is made of cast iron and is strongly ribbed to prevent distortion at any point. Four heavy

ribs are cast in the base to support the four crank shaft bearings. The crank case is machined for standard No. 3 S.A.E. transmission mounting.

The oil pan is made of pressed steel with the oil pump located in the centre of the pan. The pan is easily removable, which allows complete access to all crank shaft and rod bearings and to the oil pump.

The intake and exhaust manifolds are of the Swan type with a hot spot to assist in vaporizing the fuel.

The bell housing which encloses the flywheel is so constructed that the lower half may be removed. The motor has three point suspension.

THE OILING SYSTEM is a full force feed, pressure system. Pressure is maintained by means of a submerged gear pump, located in the centre of the motor base. The pump is driven by means of a set of spiral gears from the cam shaft. The crank shaft is hollow drilled to distribute oil to the main bearings. The connecting rods are rifle drilled to conduct oil to the piston pins.

The oil pressure is controlled by a regular valve which gives constant pressure at all engine speeds. Piston and cylinders are lubricated by oil thrown from the upper and lower ends of the connecting rods. Timing gears are fed positively from the oiling system.

THE CRANKSHAFT has four main bearings and is $2\frac{3}{4}$ " diameter. It is dropped forged from .40-.50 open hearth steel, double heat treated, machined, ground to size, hollow drilled for oil feeds and then balanced on a special crankshaft balancing machine at high speeds. The main crankshaft bearings are as follows:

Size of front	crank shaft bearing	$2\frac{3}{4}$ "x $2\frac{3}{4}$ "
" " second	" " "	$2\frac{3}{4}$ "x $2\frac{1}{4}$ "
" " third	" " "	$2\frac{3}{4}$ "x $2\frac{1}{4}$ "
" " rear	" " "	$2\frac{3}{4}$ "x $2\frac{3}{4}$ "

The rear end of the crankshaft forging has a heavy flange to which the flywheel is bolted. All main bearings are bronze backed and babbitt lined. The crankshaft counterbalances are welded in place.

THE CAM SHAFT is drop forged from .20 carbon steel. All cams and bearings are forged integral, heat treated, machined and ground to size. All cams are tested with the scleroscope for a required degree of hardness. The cam shaft is $1\frac{1}{8}$ " diameter and is supported on five bearings.

Size of front	cam shaft bearing	2.04x2 $\frac{1}{8}$ "
" " second	" " "	2.01x1"
" " third	" " "	1.990x1"
" " fourth	" " "	1.96x1"
" " rear	" " "	1.94x1 $\frac{1}{2}$ "

THE CONNECTING RODS are dropped forged from .30-.40 open hearth carbon steel. They have the "I" beam section and are double heat treated. They are $10\frac{3}{4}$ " long from centre to centre. The connecting rods are rifle drilled to permit the passage of oil from the crankshaft to the piston pin bearings. The large connecting rod bearings are pressure cast directly into the large end of the connecting rod by a centrifugal process which ensures the proper density of the metal. The upper connecting rod ends are bushed with bronze. The lower connecting rod bearings are $2\frac{1}{2}$ "x $1\frac{5}{8}$ ". The upper bronze bearings are $1\frac{1}{8}$ "x $1\frac{3}{8}$ ".

THE VALVES are entirely enclosed and the valve chamber is flooded with oil from the motor base. There are two valve cover plates, made of pressed steel. When these plates are removed the valves are easy to reach for adjustment.

The exhaust valves are made of silchrome steel especially designed to resist the high temperature of the exhaust gases. The inlet valves are made of nickel steel. The exhaust valves are $1\frac{11}{16}$ " diameter and the inlet valves $1\frac{13}{16}$ " diameter. All valves have a lift of $\frac{5}{16}$ ". Seat is 45° for both valves.

The valve lifters are the standard mushroom type carefully hardened and ground. They are flooded with oil from the crank case. Screwed into the stem of the valve

lifter is an adjusting screw with a special hardened head, held in position with a lock nut. The valves are adjusted by means of this screw.

THE WATER PUMP is located at the front end of the cylinder block at the top and is driven, together with the radiator fan by a X rubber belt from a pulley on the crankshaft. The pump is of the centrifugal type and the shaft is mounted on a roller bearing and provided with suitable stuffing box to prevent water leakage.

THE RADIATOR FAN is mounted on the front end of the pump shaft and is driven by the V shape rubber belt which also drives the water pump. The upper fan belt pulley is adjustable for the purpose of taking up slack in the belt. The fan has four ressed steel blades which are 20" in diameter. The rotation looking at the front end of the motor is clockwise. The drive pulley is 6" in diameter and the fan pulley $4\frac{3}{4}$ " in diameter. The V belt is $\frac{7}{8}$ " wide with 38 degrees included angle.

THE FLYWHEEL is attached to the crankshaft flange with six bolts. These are dimensioned bolts and the holes are reamed to size. The flywheel is made of cast iron and a steel ring gear with teeth for the starter is pressed on. The flywheel is machined for multiple disc, dry plate clutch and is carefully balanced to prevent vibration.

THE PISTONS are made of a special fine gray cast iron. They are $3\frac{7}{8}$ " diameter and $4\frac{3}{8}$ " long. They have four piston rings at the top of the piston. The piston rings are $\frac{3}{16}$ " wide. The three top rings are plain cast iron. The lower ring is a special oil wiper ring. All pistons are weighed and held within close limits.

THE SPARK PLUGS are located in the top of the cylinder head. They are $\frac{7}{8}$ " 18 U.S.F. thread.

THE LIGHTING GENERATOR is a Delco-Remy unit delivering a six volt current. It is attached to the motor on the right hand side at the front by standard S.A.E.

flange on the gear case housing and is driven by the front timing gears. The generator rotates at $1\frac{1}{2}$ times crank shaft speed. Rotation looking at the driving end of the generator is clockwise.

THE DISTRIBUTOR is mounted on the top of the cylinder head and driven by means of a set of spiral gears. The rotation, looking down on the distributor is clockwise.

THE STARTING MOTOR is mounted on the right hand side of the motor at the rear. It is attached to the front face of the flywheel housing by S.A.E. flange type mounting. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

THE STANDARD IGNITION is by battery but a magneto equipped unit can be furnished on special order.

THE TRANSMISSION is a four speed, unit power plant type which bolts directly to the flywheel housing of the motor. The transmission gears have a $\frac{7}{8}$ " width of face and are cut 6-8 and 5-7 pitch which produces exceptionally strong teeth. After the gears are cut they are first carbonized and then given a double heat treatment which produces maximum hardness on the gear tooth surface and maximum toughness inside. They are made for $3\frac{1}{2}\%$ nickel steel.

The main transmission shaft is $1\frac{13}{16}$ " in diameter and has 10 large splines which drive the gears. These shafts are made of $3\frac{1}{2}\%$ nickel steel, carefully heat treated and ground to size. The transmission shaft end is finished $1\frac{1}{2}$ " S.A.E. taper.

Annular ball bearings are used on the main shaft and on the countershaft. The main shaft front bearing is No. 308. Main shaft rear bearing is No. 308. Front countershaft bearing No. 306 and rear No. 306. Spline shaft pilot bearing No. 305.

The main transmission gear ratios are arranged as follows: Low, 6.5-1; Second, 3.7-1; Third, 1.9-1; High, 1-1; Reverse, 7.8-1.

The rear axle ratio is $7\frac{1}{4}$ -1. Therefore the total gear reductions from motor to rear axle when driving thru direct or high in the auxiliary are as follows: Low, 47.1-1; Second, 26.8-1; Third, 13.8-1; High, $7\frac{1}{4}$; Reverse, 56.5-1.

Auxiliary transmission can be furnished at extra cost.

THE CLUTCH is the dry plate, multiple disc type which consists of one set of plain steel plates, and another set of steel discs, lined on both sides with asbestos fabric facings. The steel plate are $\frac{1}{16}$ " thick, made from saw blade steel and properly hardened. The outside edges of the asbestos covered clutch discs are cut with small gear teeth which fit with similar teeth cut in the inside face of the clutch driving drum. This method of construction provides large wearing surfaces and prevents noise. The clutch driving drum is bolted to the flywheel in such a way as to prevent the possibility of its becoming loose. There are a total of 13 plates in the clutch, seven double faced plates and six plain steel plates together with the two header plates. The plates are all 8" outside diameter and 6" inside diameter, which gives a total clutch area of 310 square inches.

The clutch spring is made of a single coil of rectangular spring steel, calibrated to give the exact desired compression.

The clutch shaft is $1\frac{3}{8}$ " in diameter, made from $3\frac{1}{2}\%$ nickel steel, heat treated and ground to size. It is piloted into the flywheel with a No. 205 annular ball bearing which is provided with a grease retaining ring.

The clutch release trunnion is equipped with a specially designed ball thrust bearing, which is provided with a grease retaining ring. Both the pilot and clutch throw-out bearings have positive means of lubrication.

THE FRONT AXLE is the reverse Elliott type, with a drop forged, heat treated "I" beam of open hearth steel. The beam is $2\frac{1}{4}$ " wide, $2\frac{7}{8}$ " deep. The spring pads are forged integral with the beam.

The wheel spindles are made of nickel steel and heat treated. They are $1\frac{3}{4}$ " diameter at the inside bearing

and $1\frac{1}{4}$ " diameter at the outside bearing. The pivot bolt is 1" diameter, made of nickel steel, heat treated and ground. A Timken roller bearing No. T-102 is located in each spindle yoke head for the purpose of insuring easy steering. The steering ball on the axle arm is $1\frac{1}{2}$ " diameter. The steering cross rod is a seamless steel tube $1\frac{1}{4}$ " in diameter, and is equipped at each end with special ball and socket joint, which eliminates any possibility of the front axle cramping while turning.

The wheel bearings are the latest type Timken roller and are adjustable. The inside wheel bearing is Timken No. 4370-4320, and the outside is Timken No. 3193-3120. The front axle tread is $64\frac{3}{8}$ ".

THE REAR AXLE is a Timken, full floating, overhead worm drive type. The axle housing is a pressed steel stamping, made of $\frac{5}{16}$ " steel and electrically welded at the seams. The axle housing is reinforced with nickel steel wheel bearing spindles.

The worm is made of a special electric furnace molybdenum steel, carbonized and hardened, with the worm thread ground to extreme accuracy for lead and index thread. The worm shaft is mounted on two Timken roller bearings, No. 72200-72487 at the rear and Hyatt R. A. 409 at the front. The two Timken bearings at the rear are placed back to back so that the worm thrust, in both directions, is taken on these two bearings. The worm front end is finished with S.A.E. $1\frac{3}{4}$ " standard taper.

The worm wheel is made from Timken Special Processed nickel bronze. The teeth in the worm wheel are cut with the greatest accuracy. A new form of worm gear tooth has recently been developed, which gives these gears about five times the life of the previous type gears. The worm wheel is securely riveted to a large, four pinion, block type differential. The differential is mounted on two Timken taper roller bearings, 7584-5720 which are readily adjustable. The standard gear ratio is $7\frac{1}{4}$ -1 and special ratios can be furnished as follows: 6-1; and $8\frac{1}{2}$ -1.

The full floating axle shafts are made of nickel chromium, alloy steel and are 2" in diameter at the smallest place. The inner ends are splined and fit into the differential. The outer ends are also splined and fit into the driving flanges which are bolted to the hubs.

The wheel bearings are mounted on the nickel steel, reinforcing wheel spindles which are $3\frac{3}{8}$ " in diameter and made from $\frac{1}{2}$ " stock. This spindle reinforces the axle housing way in, close to the differential. Each wheel has two Timken roller bearings No. 592-596. The rear axle tread is approximately $65\frac{1}{2}$ " with single solid and 67" with dual pneumatics.

THE DRIVE SHAFT is made of high carbon, seamless steel tubing $2\frac{1}{4}$ " in diameter. This tubing is carefully selected and tested for true running balance at high speeds. The tube walls are .120" thick and uniform.

The Spicer universal joints are tightly enclosed in pressed steel cases which retain the lubricant and keep out the dirt. The cases are provided with adjustable locks to hold them tightly in position. The yokes of the joints are made of molybdenum steel, heat treated and ground to size. All pins and bushings are also of steel and are hardened and ground to accurate dimensions so that all parts are interchangeable. This drive shaft assembly has three joints with a centre support. The centre support consists of a malleable housing which holds a S.K.F. self aligning ball bearing and is bolted to the centre cross member of the frame by means of a flat steel support.

THE FOOT BRAKES are the Bendix Duo-Servo four wheel brakes. They are the self energizing type brake which has a very powerful action without excessive foot pressure. They are all internal expanding and are entirely enclosed, both front and rear, and are mechanically operated by the foot pedal. The braking effort is so distributed that 65% goes to the rear wheels and 35% to the front. The rear brakes are $17\frac{1}{4}$ "x4" and the front 16 "x $2\frac{1}{2}$ ".

THE HAND BRAKE is located at the rear end of the transmission. The brake band is supported by a heavy bracket attached to the end of the transmission case. The brake drum is securely riveted to the universal joint flange. The brake is of the external contracting band type. It is 9" in diameter and 5" wide. The brake lining is $\frac{1}{4}$ " thick and will wear for a long time. A thumb nut adjustment provides means for tightening up the band as the lining wears down. The hand brake should be used only for parking purposes and in an emergency. The foot pedal which operates the Bendix brakes on all four wheels should be used for all ordinary braking purposes.

THE STEERING GEAR is the Ross cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is $1\frac{3}{4}$ " diameter, is made of seamless steel tubing and finished with baked black enamel. The steering wheel is 18" in diameter and made up of laminated wood sections. The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is $1\frac{1}{2}$ " diameter, hardened and ground to size. The spark and throttle controls and the horn button are mounted in the center of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

THE FRAME is made of .20-.25 carbon open hearth steel, carefully selected and tested. Samples showing excess phosphorous or sulphur content are rejected. Side rails are heat treated.

The side rails are tapered from front to rear and are 9" deep at the center section. The top flange is $2\frac{3}{4}$ " wide and the lower flange is $2\frac{1}{4}$ " wide. The thickness of the steel in the side rails is $\frac{1}{4}$ ". Three cross members with heavy gussets are hot riveted to the side rails. The overall width of the frame from front to rear is 32". The length varies with the wheelbase.

THE SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated.

The front springs are 40" long by 3" wide. The rear springs are 56" long by 3" wide. Front spring pins are 1" diameter, and 1 1/4" diameter on the rear springs. Rear springs are built with auxiliary helpers on top.

THE RADIATOR is a polished cast aluminum shell type. The upper and lower tanks and the tubular core are made in one unit and supported on the front cross member together with the shell. The core unit is also suspended in the shell by means of side supports bolted to the shell.

The radiator has a frontal area of 473 square inches. The core has four sets of flat copper tubes arranged one tube behind the other. The tubes are surrounded by thin, irregular, horizontal, copper cooling fins.

The cooling system holds about 6 gallons of water.

Brackets for the headlights are attached to the radiator on each side.

THE THERMOSTAT regulates the temperature of the water in the motor. It is inserted in the water manifold on top of the cylinder head between the motor and the radiator. When the water is cold the thermostat valve is closed. This cuts off the water circulation until the water in the motor becomes hot at which time the thermostat valve commences to open and again allows water circulation. At about 175 degrees temperature the valve is full open in which position it will stay until the water again commences to cool off when it will automatically close.

THE STORAGE BATTERY is a six volt type, 126 ampere hour capacity. It has a molded hard rubber case and is mounted in a watertight box on the left hand running board. The battery is held by means of two clamp bolts, in such a way that no strain is put on the case. The battery is easily removable.

THE WHEELS are the malleable steel type with eight spokes which are hollow and the wheels are very strong although they are but very little heavier than ordinary wood wheels.

THE TIRES: Standard 34"x7" pneumatic front, 34"x7" dual pneumatic rear. Optional 8.25"-20" base balloons front, 8.25"-20" dual balloons rear or 36"x5" solid front 36"x10" single solid rear.

Special at extra cost, 36"x8" pneumatic front, 36"x8" dual pneumatic rear.

THE GASOLINE TANK is located on the side of the frame. The capacity is 31 gallons. The tank is constructed of 18 gauge terne plate. The header plates are stamped, dished section and fastened in place by a lapped and rolled seam joint, which is also soldered. The tank has a drain plug at the bottom. Stewart vacuum tank is used. There is a gasoline gauge on the side.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing points and a high pressure Alemite grease gun furnished with each truck as standard equipment.

PAINT. All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.

HEADLIGHTS are the new type having controllable beam. The large bulb has double filaments and produces the high or long distance light for country work on the lower filament, while the upper filament produces a short flood light for city driving.

An additional bulb with single filament furnishes parking lights.

The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell and rim are chrome finish and the lens comply with all state requirements.

MODEL 19X—3½ TON

Specifications

Rated Capacity - -	7000 pounds.
Wheel Base - - - -	Standard 165". Special 147", 176", 190", 220" and 235".
Track - - - - -	Front 66". Rear, single solid, 65½". Rear dual pneumatic 67".
Tire Equipment - -	Front 36"x5" solid, Rear 36"x10" solid. Special Front 34"x7" Pneu., Rear 34"x7" dual Pneu. at special price. Special Front 36"x8" Pneu.; Rear 36"x8" dual Pneu. at special price.
Chassis Weight - -	7010 pounds. Standard wheelbase and tires.
Body Length - - -	From ten to twenty feet, depending on wheel base.
Engine - - - - -	Six cylinder, size 3⅞"x5". Piston Displacement 354 cu. in. Horse Power 36.04 S.A.E., Actual 90 H.P. at 2750 R.P.M. Maximum Torque 224 foot pounds. Cooling—Centrifugal water pump. Carburetor—Stromberg. S. A. E. 1½" flange. Counter balanced crankshaft.
Rear Axle Ratio -	Standard 7¼-1; Special 8½-1 or 6-1 at extra cost. Worm Gear.
Transmission - - -	Dual Type. Twelve speeds.
Main Transmission	Standard four speed. Low, 6.5-1; Second, 3.7-1; Third, 1.9-1; High, 1-1; Reverse, 7.8-1.
Auxiliary Transmission - - -	Step up, .67-1; Reduction, 2.25-1.

- Turning Radius - - 29 feet on 165" wheelbase and 36" x 8" pneumatic tires.
- Brakes - - - - - Foot brakes, four wheel Bendix Duo-Servo. Front 16"x2½"; rear 17¼"x4". Hand brake on transmissions size 9"x5".
- Gasoline Tank - - - Located on side of frame. Capacity 31 gallons. Stewart vacuum system with booster. Gasoline gauge.
- Frame - - - - - Depth 9", width 2¾", steel ¼" thick. Heat treated.
- Front Springs - - - Size 40" long, 3" wide, twelve leaves.
- Rear Springs - - - Size 56" long, 3" wide, fifteen leaves in main spring. 6 leaves in helper.
- Radius Rods - - - Standard Equipment.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric horn and battery; vacuum tank with booster and gas filter; tool kit, jack, rear tire carrier, spare rim, speedometer, windshield wiper and mirror on all bodies and cabs, carburetor air cleaner, thermostat, gasoline gauge, stop light, and Alemite grease gun. The instrument board is equipped with Ammeter, oil gauge, starting choke button, lighting and ignition switches and indirect dash light.

Model 19X—Mechanical Description

MODEL 19X MOTOR—6 CYLINDER: This motor has six cylinders, cast enbloc, vertical "L" head type with detachable cylinder block and detachable cylinder head. The cylinders are made of a special close grained, gray iron. There are large water spaces around the cylinders and valves and over the combustion chambers.

The motor size is 3⅞" bore by 5" stroke and actually develops 90 H.P. at 2750 R.P.M. The motor is designed with counter balanced crankshaft.

The crank case is made of cast iron and is strongly ribbed to prevent distortion at any point. Four heavy ribs are cast in the base to support the four crank shaft bearings. The crank case is machined for standard No. 3 S.A.E. transmission mounting.

The oil pan is made of pressed steel with the oil pump located in the centre of the pan. The pan is easily removable, which allows complete access to all crank shaft and rod bearings and to the oil pump.

The intake and exhaust manifolds are of the Swan type with a hot spot to assist in vaporizing the fuel.

The bell housing which encloses the flywheel is so constructed that the lower half may be removed. The motor has three point suspension.

THE OILING SYSTEM is a full force feed, pressure system. Pressure is maintained by means of a submerged gear pump, located in the centre of the motor base. The pump is driven by means of a set of spiral gears from the cam shaft. The crank shaft is hollow drilled to distribute oil to the main bearings. The connecting rods are rifle drilled to conduct oil to the piston pins.

The oil pressure is controlled by a regulator valve to give constant pressure at all motor speeds.

Piston and cylinders are lubricated by oil thrown from the upper and lower ends of the connecting rods. Timing gears are fed positively from the oiling system.

THE CRANKSHAFT has four main bearings and is 2¾" diameter. It is dropped forged from .40-.50 open hearth steel, double heat treated, machined, ground to size, hollow drilled for oil feeds and then balanced on a special crankshaft balancing machine at high speeds. The main crankshaft bearings are as follows:

Size of front	crank shaft bearing	2¾"x2¾"
" " second	" " "	2¾"x2¼"
" " third	" " "	2¾"x2¼"
" " rear	" " "	2¾"x2¾"

The rear end of the crankshaft forging has a heavy flange to which the flywheel is bolted. All main bearings are bronze backed and babbitt lined. The crankshaft counterbalances are welded in place.

THE CAM SHAFT is drop forged from .20 carbon steel. All cams and bearings are forged integral, heat treated, machined and ground to size. All cams are tested with the scleroscope for a required degree of hardness. The cam shaft is 1⅛" diameter and is supported on five bearings.

Size of front	cam shaft bearing	2.04x2⅛"
" " second	" " "	2.01x1"
" " third	" " "	1.990x1"
" " fourth	" " "	1.96x1"
" " rear	" " "	1.94x1½"

THE CONNECTING RODS are dropped forged from .30-.40 open hearth carbon steel. They have the "I" beam section and are double heat treated. They are 10¾" long from centre to centre. The connecting rods are rifle drilled to permit the passage of oil from the crankshaft to the piston pin bearings. The large connecting rod bearings are pressure cast directly into the large end of the connecting rod by a centrifugal process which ensures the proper density of the metal. The upper connecting rod ends are bushed with bronze. The lower connecting rod bearings are 2½" x 1⅝". The upper bronze bushings are 1⅛" x 1⅜".

THE VALVES are entirely enclosed and the valve chamber is flooded with oil from the motor base. There are two valve cover plates, made of pressed steel. When these plates are removed the valves are easy to reach for adjustment.

The exhaust valves are made of silchrome steel especially designed to resist the high temperature of the exhaust gases. The inlet valves are made of nickel steel. The exhaust valves are 1⅛" diameter and the inlet valves 1⅜" diameter. All valves have a lift of ⅝". Seat is 45° for both valves.

The valve lifters are the standard mushroom type carefully hardened and ground. They are flooded with oil from the crank case. Screwed into the stem of the valve lifter is an adjusting screw with a special hardened head, held in position with a lock nut. The valves are adjusted by means of this screw.

THE WATER PUMP is located at the front end of the cylinder block at the top and is driven, together with the radiator fan by a V rubber belt from a pulley on the crankshaft. The pump is of the centrifugal type and the shaft is mounted on a roller bearing and provided with suitable stuffing box to prevent water leakage.

THE RADIATOR FAN is mounted on the front end of the pump shaft and is driven by the V shape rubber belt which also drives the water pump. The upper fan belt pulley is adjustable for the purpose of taking up slack in the belt. The fan has four pressed steel blades which are 20" in diameter. The rotation looking at the front end of the motor is clockwise. The drive pulley is 6" in diameter and the fan pulley 4¾" in diameter. The V belt is 7/8" wide with 38 degrees included angle.

THE FLYWHEEL is attached to the crankshaft flange with six bolts. These are dimensioned bolts and the holes are reamed to size. The flywheel is made of cast iron and a steel ring gear with teeth for the starter is pressed on. The flywheel is machined for multiple disc, dry plate clutch and is carefully balanced to prevent vibration.

THE PISTONS are made of a special fine gray cast iron. They are 3⅞" diameter and 4⅜" long. They have four piston rings at the top of the piston. The piston rings are 3/16" wide. The three top rings are plain cast iron. The lower ring is a special oil wiper ring. All pistons are weighed and held within close limits.

THE SPARK PLUGS are located in the top of the cylinder head. They are $\frac{7}{8}$ " 18 U.S.F. thread.

THE LIGHTING GENERATOR is a Delco-Remy unit delivering a six volt current. It is attached to the motor on the right hand side at the front by standard S.A.E. flange on the gear case housing and is driven by the front timing gears. The generator rotates at $1\frac{1}{2}$ times crank shaft speed. Rotation looking at the driving end of the generator is clockwise.

THE DISTRIBUTOR is mounted on the top of the cylinder head and driven by means of a set of spiral gears. The rotation, looking down on the distributor is clockwise.

THE STARTING MOTOR is mounted on the right hand side of the motor at the rear. It is attached to the front face of the flywheel housing by S.A.E. flange type mounting. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in the rim of the flywheel.

THE STANDARD IGNITION is by battery but a magneto equipped unit can be furnished on special order.

THE TRANSMISSION is the dual type having 12 forward speeds and three reverse speeds.

THE MAIN TRANSMISSION is a four speed, unit power plant type which bolts directly to the flywheel housing of the motor. The transmission gears have a $\frac{7}{8}$ " width of face and are cut 6-8 and 5-7 pitch which produces exceptionally strong teeth. After the gears are cut they are first carbonized and then given a double heat treatment which produces maximum hardness on the gear tooth surface and maximum toughness inside. They are made from $3\frac{1}{2}\%$ nickel steel.

The main transmission shaft is $1\frac{13}{16}$ " in diameter and has 10 large splines which drive the gears. These shafts are made of $3\frac{1}{2}\%$ nickel steel, carefully heat treated and ground to size. The transmission shaft end is finished $1\frac{1}{2}$ " S.A.E. taper.

Annular ball bearings are used on the main shaft and on the countershaft. The main shaft front bearing is No. 308. Main shaft rear bearing is No. 308. Front countershaft bearing No. 306 and rear No. 306. Spline shaft pilot bearing No. 305.

The main transmission gear ratios are arranged as follows: Low, 6.5-1; Second, 3.7-1; Third, 1.9-1; High, 1-1; Reverse, 7.8-1.

The rear axle ratio is 7¼-1. Therefore the total gear reductions from motor to rear axle when driving thru direct or high in the auxiliary are as follows: Low, 47.1-1; Second, 26.8-1; Third, 13.8-1; High, 7¼; Reverse, 56.5-1.

THE AUXILIARY TRANSMISSION is standard equipment. It is located amidships, and is operated by a separate gear shift lever. It has three speeds, a high gear, which gives no speed reduction; a .67-1 ratio overdrive gear, and a 2.25-1 ratio low gear.

When the auxiliary transmission change gear lever is set in high speed, the main unit power plant transmission drives right through without changing the gear ratio to the rear axle.

When the auxiliary transmission gear lever is set in the overdrive position, with a rear axle ratio of 7¼-1 then the following gear ratios to the rear axle are obtainable: Low, 31.5-1; Second, 18-1; Third, 9.25-1; Fourth, 4.8-1; Reverse, 38-1.

With the auxiliary transmission gear lever set in the low speed position, with a rear axle ratio of 7¼-1, then the following gear ratios to the rear axle are obtainable: Low, 105-1; Second, 60-1; Third, 31-1; Fourth, 16.3-1; Reverse, 127-1.

The auxiliary transmission is very rugged in construction. The main shaft is 2" square and the countershaft 2" in diameter. The gears have 1½" width of face and are cut 5-7 pitch. All bearings are Timken taper roller bearings, of ample size and provided with adjustments.

THE CLUTCH is the dry plate, multiple disc type which consists of one set of plain steel plates, and another set

of steel discs, lined on both sides with asbestos fabric facings. The steel plates are $\frac{1}{16}$ " thick, made from saw blade steel and properly hardened. The outside edges of the asbestos covered clutch discs are cut with small gear teeth which fit with similar teeth cut in the inside face of the clutch driving drum. This method of construction provides large wearing surfaces and prevents noise. The clutch driving drum is bolted to the flywheel in such a way as to prevent the possibility of its becoming loose. There are a total of 13 plates in the clutch, seven double faced plates and six plain steel plates together with the two header plates. The plates are all 8" outside diameter and 6" inside diameter, which gives a total clutch area of 310 square inches.

The clutch spring is made of a single coil of rectangular spring steel, calibrated to give the exact desired compression.

The clutch shaft is $1\frac{3}{8}$ " in diameter, made from 3½% nickel steel, heat treated and ground to size. It is piloted into the flywheel with a No. 205 annular ball bearing which is provided with a grease retaining ring.

The clutch release trunnion is equipped with a specially designed ball thrust bearing, which is provided with a grease retaining ring. Both the pilot and clutch throw-out bearings have positive means of lubrication.

THE FRONT AXLE has a drop forged, heat treated "I" beam of open hearth steel. The beam is $2\frac{1}{2}$ " wide by 3" deep. The spring pads are forged integral with the beam.

The wheel spindles are made of nickel steel and heat treated. They are 2" diameter at the inside bearing and $1\frac{3}{8}$ " diameter at the outside bearing. The pivot bolt is $1\frac{1}{8}$ " diameter, made of nickel steel, heat treated and ground. The steering ball on the axle is $1\frac{1}{2}$ " diameter. The steering cross rod is a seamless steel tube $1\frac{1}{4}$ " in diameter, and is equipped at each end with ball and socket joints which eliminates all cramping. The track is 66".

The wheel bearings are the latest type Timken roller and are adjustable. The inside wheel bearing is Timken No. 532-537 and the outside Timken No. 432-449.

THE REAR AXLE is a Timken, full floating, overhead worm drive type. The axle housing is a pressed steel stamping, made of $\frac{5}{16}$ " steel and electrically welded at the seams. The axle housing is reinforced with nickel steel wheel bearing spindles.

The worm is made of a special electric furnace molybdenum steel, carbonized and hardened, with the worm thread ground to extreme accuracy for lead and index thread. The worm shaft is mounted on two Timken roller bearings, No. 72200-72487 at the rear and Hyatt R. A. 409 at the front. The two Timken bearings at the rear are placed back to back so that the worm thrust, in both directions, is taken on these two bearings. The worm front end is finished with S.A.E. $1\frac{3}{4}$ " standard taper.

The worm wheel is made from Timken Special Processed nickel bronze. The teeth in the worm wheel are cut with the greatest accuracy. A new form of worm gear tooth has recently been developed, which gives these gears about five times the life of the previous type gears. The worm wheel is securely riveted to a large, four pinion, block type differential. The differential is mounted on two Timken taper roller bearings, 5784-5720 which are readily adjustable. The standard gear ratio is $7\frac{1}{4}$ -1 and special ratios can be furnished as follows: 6-1; and $8\frac{1}{2}$ -1.

The full floating axle shafts are made of nickel chromium, alloy steel and are 2" in diameter at the smallest place. The inner ends are splined and fit into the differential. The outer ends are also splined and fit into the driving flanges which are bolted to the hubs.

The wheel bearings are mounted on the nickel steel, reinforcing wheel spindles which are $3\frac{3}{8}$ " in diameter and made from $\frac{1}{2}$ " stock. This spindle reinforces the axle housing way in, close to the differential. Each wheel has two Timken roller bearings No. 592-596. The rear

axle tread is approximately 65½" with single solid and 67" with dual pneumatics.

THE DRIVE SHAFT is made of high carbon, seamless steel tubing 2¼" in diameter. This tubing is carefully selected and tested for true running balance at high speeds. The tube walls are .120" thick and uniform.

The Spicer universal joints are tightly enclosed in pressed steel cases which retain the lubricant and keep out the dirt. The cases are provided with adjustable locks to hold them tightly in position. The yokes of the joints are made of molybdenum steel, heat treated and ground to size. All pins and bushings are also of steel and are hardened and ground to accurate dimensions so that all parts are interchangeable. This drive shaft assembly has three joints with a centre support. The centre support consists of a malleable iron housing which holds a S.K.F. self aligning ball bearing and is bolted to the center cross member of the frame by means of a flat steel support.

THE FOOT BRAKES are the Bendix Duo-Servo four wheel brakes. They are the self energizing type brake which has a very powerful action without excessive foot pressure. They are all internal expanding and are entirely enclosed, both front and rear, and are mechanically operated by the foot pedal. The braking effort is so distributed that 65% goes to the rear wheels and 35% to the front. The rear brakes are 17¼"x4" and the front 16"x2½".

THE HAND BRAKE is located at the rear end of the transmission. The brake band is supported by a heavy bracket attached to the end of the transmission case. The brake drum is securely riveted to the universal joint flange. The brake is of the external contracting band type. It is 9" in diameter and 5" wide. The brake lining is ¼" thick and will wear for a long time. A thumb nut adjustment provides means for tightening up the band as the lining wears down. The hand brake should be used only for parking purposes and in an

emergency. The foot pedal which operates the Bendix brakes on all four wheels should be used for all ordinary braking purposes.

THE STEERING GEAR is the Ross cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is 1¾" diameter, is made of seamless steel tubing and finished with baked black enamel. The steering wheel is 20" diameter and made up of laminated wood sections. The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is 1½" diameter, hardened and ground to size. The spark and throttle controls and the horn button are mounted in the centre of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

THE FRAME is made of .20-.25 carbon open hearth steel, carefully selected and tested. Samples showing excess phosphorous or sulphur content are rejected. Side rails are heat treated.

The side rails are tapered from front to rear and are 9" deep at the centre section. The top flange is 2¾" wide and the lower flange is 2¼" wide. The thickness of the steel in the side rails is ¼". Three cross members with heavy gussets are hot riveted to the side rails. The overall width of the frame from front to rear is 32". The length varies with the wheelbase.

THE SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated.

The front springs are 40" long by 3" wide. The rear springs are 56" long by 3" wide. Front spring pins are 1" diameter, and 1¼" diameter on the rear springs. Rear springs are built with auxiliary helpers on top.

THE RADIATOR is a polished cast aluminum shell type. The upper and lower tanks and the tubular core are made in one unit and supported on the front cross member together with the shell. The core unit is also suspended in the shell by means of side supports bolted to the shell. The radiator has a frontal area of 473 square inches. The core has four sets of flat copper tubes arranged one tube behind the other. The tubes are surrounded by thin, irregular, horizontal copper cooling fins.

The cooling system holds about 6 gallons of water.

Brackets for the headlights are attached to the radiator on each side.

THE THERMOSTAT regulates the temperature of the water in the motor. It is inserted in the water manifold on top of the cylinder head between the motor and the radiator. When the water is cold the thermostat valve is closed. This cuts off the water circulation until the water in the motor becomes hot at which time the thermostat valve commences to open and again allows water circulation. At about 175 degrees temperature the valve is full open in which position it will stay until the water again commences to cool off when it will automatically close.

THE STORAGE BATTERY is a six volt type, 126 ampere hour capacity. It has a molded hard rubber case and is mounted in a watertight box on the left hand running board. The battery is held by means of two clamp bolts, in such a way that no strain is put on the case. The battery is easily removable.

THE WHEELS are the malleable steel type with eight spokes which are hollow and the wheels are very strong although they are but very little heavier than ordinary wood wheels.

THE TIRES are, Standard equipment, Front 36" x 5" rear 36" x 10" solid. Special price front 34" x 7" Pneu.; rear 34" x 7" Pneu. dual heavy duty. Special price front 36" x 8" Pneu.; rear 36" x 8" Pneu. dual heavy duty.

THE GASOLINE TANK is located on the side of the frame. The capacity is 31 gallons. The tank is constructed of 18 gauge terne plate. The header plates are stamped, dished section and fastened in place by a lapped and rolled seam joint, which is also soldered. The tank has a drain plug at the bottom. Stewart vacuum tank is used. There is a gasoline gauge on the side.

HEADLIGHTS are the new type having controllable beam. The large bulb has double filaments and produces the high or long distance light for country work on the lower filament, while the upper filament produces a short flood light for city driving.

An additional bulb with single filament furnishes parking lights.

The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell and rim are chrome finish.

The lens comply with all state requirements.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing points and a high pressure Alemite grease gun furnished with each truck as standard equipment.

PAINT. All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.

MODEL 31X—5 TON**Specifications**

Rated Capacity	- -	10,000 pounds.
Wheelbase	- - - -	Standard 165". Special 150". Special long wheelbases 175", 190", 220" and 235" at extra cost.
Track	- - - - -	Front 66". Rear 74" on dual tires.
Tire Equipment	- -	Standard 36"x6" solid front, 36"x6" dual solid rear. Special at extra cost 38"x9" pneumatic front, 38"x9" dual pneumatic rear or 40"x10" pneumatic front, 40"x10" dual pneumatic rear.
Chassis Weight	- -	8400 pounds on standard wheelbase.
Body Length	- - -	10' to 20' according to wheelbase.
Engine	- - - - -	Six cylinder—size 4 $\frac{3}{8}$ "x5 $\frac{1}{8}$ ". Piston displacement 462 cu. in. Horse power—Actual 100 H.P. at 2000 R.P.M. S.A.E. 45.9 Maximum torque 275 foot pounds at 900 R.P.M. Cooling by centrifugal water pump. Carburetor, Stromberg S.A.E. 1 $\frac{1}{2}$ " flange.
Clutch	- - - - -	15 plate, multiple disc, ventilated drum.
Transmission	- - -	Eight speeds, dual unit type consisting of a two speed clutch unit bolted to the engine and a 4 speed main frame transmission. Ratios as follows: High Range, First, 3.21-1; Second, 1.62-1; Third, 1-1; Fourth, .75-1; Reverse, 3.21-1. Low Range, First, 9.38-1; Second, 4.73-1; Third, 2.92-1; Fourth, 2.18-1; Reverse, 9.38-1; Overdrive on the high range.

- Turning Radius - - 28' for standard wheelbase and tires.
- Brakes - - - - - Foot brakes are four wheel, mechanical. Front 16"x2½"; rear 17¼"x5". The foot brakes are equipped with a B.K. vacuum booster which is standard equipment. Hand brake on rear of main frame transmission, size 11"x5".
- Gasoline Tank - - Located under driver's seat. Capacity 40 gallons. Stewart booster vacuum system. Dash type gasoline gauge.
- Frame - - - - - Depth 9 $\frac{1}{16}$ ", width of flange 2¾", stock thickness 9/32". Heat treated.
- Front Spring - - - Size 40" long, 3" wide, 14 leaves.
- Rear Spring - - - Size 56" long, 4" wide, 14 leaves in main spring, 6 leaves in auxiliary spring.
- Radius Rods - - - Standard equipment.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric windshield wiper and mirror on all bodies and cabs, electric horn and battery; vacuum tank with booster and gas filter, tool kit, hydraulic jack, rear tire carrier, spare rim, speedometer, air cleaner, thermostat, stop light, and Alemite grease gun. The instrument board is equipped with ammeter, oil gauge, starting choke button, gasoline gauge, ignition switch and indirect dash light.

Model 31C—Mechanical Description

ENGINE: Six cylinder, Waukesha engine, 4¾"x5⅛", completely insulated from the frame by rubber. It is of the "L" head type with detachable cylinder heads and cylinder block. The cylinders are cast enbloc and the head is in two parts. Exceptional strength and rigidity

is given the engine by its girder crankcase, truncated cylinders and heavy, seven bearing crankshaft.

A special intake and exhaust manifold and the Ricardo head insures maximum power with minimum fuel consumption.

The chrome nickel cylinder blocks together with the cast iron pistons make an ideal wear resisting combination.

The engine weighs approximately 1150 pounds.

OILING SYSTEM: A screened, gear type oil pump located in a sump in the base, forces the oil to the seven main bearings, the rod bearings, the cam shaft bearings, the piston pin bearings, and to the gear case bearings and gears. In all, 25 bearings and gears are lubricated by oil which is thoroughly cleaned each time it passes thru the motor by a Hall-Winslow Oil Filter which is mounted on the engine.

CRANK SHAFT is made from S.A.E. 1045 steel, heat treated, has seven main bearings of the following sizes:

Front Main Bearing (Dia. x length) 3"x1 $\frac{7}{8}$ ".

Center and Rear Main Bearings (Dia. x length) 3"x3".

Four Intermediate Main Bearings (Dia. x length)
3"x1 $\frac{1}{2}$ "

The rear end of the crank shaft forging has a heavy flange to which the flywheel is bolted. All main bearings are bronze backed and special alloy lined.

CAM SHAFT is drop forged with all cams and bearings forged integral, carefully heat treated and ground to size. The diameter is 1 $\frac{3}{8}$ ". The cams are tested with scleroscope to insure the proper degree of hardness.

CONNECTING RODS are forged from S.A.E. 1045 steel and heat treated. A special, long life, bearing material is cast directly into the big ends. They are 10 $\frac{1}{4}$ " long from center to center. The lower connecting rod bearings are 2 $\frac{3}{4}$ " dia., x 1 $\frac{3}{4}$ " long.

THE VALVES are entirely enclosed and the valve chamber is flooded with oil from the engine base. There are two valve cover plates, made of pressed steel. When these plates are removed the valves are easily reached for adjustment. The intake valves are made of chrome nickel steel and the exhaust valves are made of silcrome steel to resist the high temperatures of the exhaust gases. The exhaust valves are $1\frac{3}{8}$ " diameter and the intake valves are $1\frac{5}{8}$ " diameter.

The "Girder" type crankcase practically eliminates all valve burning due to the great depth of metal between the camshaft and valve supports in the cylinders.

THE PUSH RODS are large diameter, hollow, case hardened and ground, mushroom type, with lock nut adjustment.

THE FLYWHEEL is attached to the crankshaft flange with six bolts. These are dimensioned bolts and the holes are reamed to size. The flywheel is made of cast iron and a steel ring gear with teeth for the starter is pressed on. The flywheel is machined for multiple disc, dry plate clutch and is carefully balanced to prevent vibration.

THE PISTONS are made of a special fine gray, cast iron. They are $4\frac{3}{8}$ " diameter and $4\frac{1}{2}$ " long. They have four piston rings at the top of the piston. The three top rings are $\frac{1}{8}$ " wide and are the plain cast iron type. The lower ring is $\frac{3}{16}$ " wide and is a special oil wiper ring. All pistons are weighed and held within close limits.

THE WATER PUMP is of the centrifugal type driven by a shaft from the gear case. There is a water intake manifold running the full length of the cylinder block which insures an ample supply of cooled water to both the front and rear cylinders.

A THERMOSTAT mounted in the water outlet manifold insures proper operating temperatures under all conditions.

THE FAN is mounted on a bracket on the front of the motor and driven by a "V" belt from a pulley on the pump shaft. The fan runs on roller bearings, has aluminum blades and runs $1\frac{1}{2}$ times crankshaft speed.

THE GOVERNOR: A positive operating governor is built into each motor to protect it from overspeeding. When leaving the factory this governor is set at 2000 R.P.M.

THE SPARK PLUGS are located in the top of the cylinder heads. They are standard S.A.E. 18 M.M. plugs.

LIGHTING GENERATOR is a Delco-Remy unit delivering a six volt current. It is attached to the motor on the right hand side at the front by S.A.E. flange on the gear case housing and is driven by the front timing gears. The generator rotates at $1\frac{1}{2}$ times crankshaft speed. Rotation looking at the driving end of the generator is anti-clockwise.

THE DISTRIBUTOR is mounted on the left hand side of the engine near the front and driven by means of a set of spiral gears. The rotation, looking down on the distributor is clockwise.

STARTING MOTOR is mounted on the right hand side of the engine at the rear. It is attached to the front face of the flywheel housing by S.A.E. flange type mounting. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in a steel ring gear pressed on the flywheel rim.

STANDARD IGNITION is by battery but magneto can be furnished on special order.

THE TRANSMISSION is the multiple speed, dual unit type consisting of a two speed clutch unit bolted directly to the bell housing of the engine and a four speed main frame transmission, on a three point mounting. This

combination gives a selection of eight speeds forward and two reverse including a low low and an overdrive.

The gears in the two speed clutch unit are made from 3½% nickel steel. They are cut 6-8 and 5-7 pitch and have a 7/8" width of face. After the gears are cut they are first carbonized and then given a double heat treatment which produces maximum hardness on the gear tooth surface and maximum toughness inside. Both the main shaft and countershaft run on annular ball bearings. The main shaft pilot bearing is No. 304 and the rear bearing is No. 308. The clutch shaft bearing is No. 308. The front and rear counter shaft bearings are No. 306.

The gears in the main frame transmission are made from the same material and given the same heat treatment as the gears in the two speed clutch unit. The teeth are cut 4.5-6 pitch and the gears have face widths from 1" to 1½" according to the load they must carry. The pilot bearing on the main shaft is No. 307 and the rear bearing No. 310. The front counter shaft bearing is No. 307 and the rear No. 308.

The following ratios are obtainable:
Low Range—First, 9.38-1; Second, 4.73-1; Third, 2.92-1; Fourth, 2.18-1; Reverse, 9.38-1.
High Range—First, 3.21-1; Second, 1.62-1; Third, 1-1; Fourth, .75-1; Reverse, 3.21-1.

Using an 8¾-1 rear axle ratio gives the following ratios to the rear wheels:

Low Range—First, 82-1; Second, 41.4-1; Third, 25.6-1; Fourth, 19-1; Reverse, 82-1.
High Range—First, 28-1; Second, 14.15-1; Third, 8.75-1; Fourth, 6.56-1; Reverse, 28-1.

THE CLUTCH is the dry plate, multiple disc type which consists of one set of plain steel and another set of steel discs, lined on both sides with asbestos fabric facings. The steel plates are 1/16" thick, made from saw blade steel and properly hardened. The outside edges of the asbestos covered clutch discs are cut with small gear teeth which fit with similar teeth in the inside face of the clutch driving drum. This method of construction provides large wearing surfaces and prevents noise. The

clutch driving drum is bolted to the flywheel in such a way as to prevent the possibility of its becoming loose. There are a total of 15 plates in the clutch, eight double faced plates and seven plain steel plates together with two header plates. The plates are all 8" outside diameter and 6" inside diameter, which gives a total clutch area of 352 square inches.

The clutch spring is made of a single coil of rectangular spring steel, calibrated to give the exact desired compression which is 750 pounds. However the clutch pedal has a reduction leverage arrangement which provides a very soft pedal pressure for releasing the clutch.

The clutch shaft is $1\frac{3}{8}$ " diameter, made from $3\frac{1}{2}\%$ nickel steel, heat treated and ground to size. It is piloted into the flywheel with a No. 205 annular ball bearing which is provided with a grease retaining ring.

The clutch release trunnion is equipped with a specially designed ball thrust bearing, which is provided with a grease retaining ring. Both the pilot and clutch throw-out bearings have positive means of lubrication.

THE FRONT AXLE has a drop forged, heat treated, "I" beam of open hearth steel. The beam is $2\frac{1}{2}$ " wide by 3" deep. The spring pads are forged integral with the beams.

The wheel spindles are made of nickel steel and heat treated. They are 2" diameter at the inside bearing and $1\frac{3}{8}$ " diameter at the outside bearing. The pivot bolt is $1\frac{1}{8}$ " diameter, made of nickel steel, heat treated and ground. The steering ball on the axle is $1\frac{1}{2}$ " diameter. The steering cross rod is a seamless steel tube $1\frac{1}{4}$ " in diameter, and is equipped at each end with ball and socket joints which eliminates all cramping. The track is 66".

The wheel bearings are the latest type Timken roller and are adjustable. The inside wheel bearing is Timken No. 532-537 and the outside Timken No. 432-449.

THE REAR AXLE is a Timken, full floating, overhead worm drive type. The axle housing is a heavy section cast steel with reinforcing sleeves of nickel alloy steel $3\frac{1}{2}$ " diameter.

The worm is made of a special electric furnace molybdenum steel, carbonized and hardened, with the worm thread ground to extreme accuracy for lead and index thread. The worm shaft is mounted on two Timken roller bearings No. 72487-72200 at the rear and Hyatt RA-409 at the front. The two Timken bearings at the rear are placed back to back so that the worm thrust, in both directions, is taken on these two bearings. The worm front end is finished with S.A.E 1 $\frac{3}{4}$ " Standard taper.

The worm wheel is made from Timken Special Processed nickel bronze. The teeth in the worm wheel are cut with the greatest accuracy. A new form of worm gear tooth has recently been developed which gives these gears about five times the life of the previous type gears. The worm wheel is securely riveted to a large, four pinion, block type differential. The differential is mounted on two Timken taper roller bearings No. 5757-5720 which are readily adjustable. The standard gear ratio is $8\frac{3}{4}$ -1 and special ratio can be furnished $7\frac{4}{5}$ -1 and $10\frac{1}{3}$ -1.

The full floating axle shafts are made of nickel chromium, alloy steel and are $2\frac{1}{8}$ " in diameter at the smallest place. The inner ends are splined and fit into the differential. The outer ends are also splined and fit into the driving flanges which are bolted to the hubs.

The wheel bearings are mounted on the nickel steel, reinforcing wheel spindles which are $3\frac{1}{2}$ " in diameter and made from $\frac{9}{16}$ " stock. This spindle reinforces the axle housing way in close to the differential. Each wheel has two Timken roller bearings No. 6521-6552 and 5720-5755. The rear axle tread is approximately 74" with dual tires.

THE DRIVE SHAFT is made of high carbon seamless steel tubing $2\frac{5}{8}$ " in diameter. This tubing is carefully selected and tested for true running balance at high speeds.

The Spicer universal joints are tightly enclosed in pressed steel casings of the latest type. The cases are provided with adjustable locks to hold them securely in position. The yokes of the joints are made of molyb-

denum steel, and are hardened and ground to accurate dimensions so that all parts are interchangeable. The two and three piece shafts are supported by midbearings of the S-K-F self aligning type.

THE FOOT BRAKES are four wheel mechanical. The front brakes are Bendix Duo-Servo 16"x2½". The rear brakes are Timken Duplex 17¼"x5". The two sets of Timken rear brakes are connected together so that they operate as one unit. Both front and rear brakes are equipped with molded linings which give unusually long life. Adjustment is made easy by adjustable yokes on the rear brakes. The braking effort is so distributed that about 70% goes to the rear brakes and 30% to the front.

The physical effort needed to apply the brakes is very little as the work is done by a Bragg-Kliesrath vacuum booster of the latest type. This is known as their P. D. L.-6 model and is operated with their XT½ external valve. The brakes are all internal expanding and are entirely enclosed both front and rear.

THE HAND BRAKE is located on the rear of the main frame transmission and is supported from the rear transmission cross member. The brake is of the external contracting type. It is 11" in diameter and 5" wide. The brake lining is ¼" thick. A wing nut adjustment takes care of wear.

The hand brake should be used only for parking or in case of emergency. The foot pedal which operates the service brakes should be used for all ordinary braking purposes.

THE STEERING GEAR is the Ross cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is 2¼" diameter, is made of seamless steel tubing and finished with baked black enamel. The steering wheel is 20" diameter.

The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated

end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is $1\frac{1}{2}$ " diameter, hardened and ground to size. The spark and throttle controls and the horn button are mounted in the center of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

THE FRAME is made of .20-.25 carbon open hearth steel, carefully selected and tested. Samples showing excess phosphorus or sulphur content are rejected. Side rails are heat treated.

The side rails are tapered from front to rear and are $9\frac{1}{16}$ " deep at the center section. The top flange is $2\frac{3}{4}$ " wide and the bottom is $2\frac{3}{4}$ " wide. The thickness of the steel in the side rails is $9/32$ ". Four cross members with heavy gussets are hot riveted to the side rails. The overall width of the frame from front to rear is 34". The length varies with the wheelbase.

SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy silico manganese steel, carefully formed and heat treated.

The front springs are 40" long by 3" wide and have 14 leaves. The rear springs are 56" long, by 4" wide and have 14 leaves in the main spring and 6 leaves in the helper spring. The spring pins are 1" diameter on the front springs and $1\frac{1}{2}$ " diameter on the rear springs. Rear springs are built with auxiliary helpers on top.

THE RADIATOR is the tubular type with cast tanks and side members.

The core has four rows of flat tubes arranged one tube behind the other. The tubes are surrounded by thin, irregular, horizontal, copper cooling fins. The upper and lower ends of the tubes are held in perforated brass header plates which are bolted to their respective top and bottom tanks. This makes an extremely strong and rugged construction, free from leaks and cracks. The radiator core is $3\frac{3}{4}$ " thick and has a frontal area of 612 sq. in. The cooling system holds $8\frac{1}{2}$ gallons of water.

The bottom tank is made of malleable iron, while the side members and the top tank are made of cast aluminum which is highly polished.

The headlight brackets are of polished aluminum and attached to the radiator side members.

The radiator is mounted on the side rails and is insulated from road shocks by rubber mountings.

STORAGE BATTERY is a six volt type, 166 ampere hour capacity and has 17 plates. It has a molded hard rubber case and is mounted in a water tight box on the left hand running board. The battery is held by means of two clamp bolts, in such a way that no strain is put on the case. The battery is easily removable.

THE WHEELS are the steel type with eight spokes which are hollow. They are very strong, although they are but little heavier than ordinary wood wheels.

THE TIRES are, standard equipment—36" x 6" solid front, rear—36" x 6" dual, solid. Pneumatic tires at extra cost are as follows: 38" x 9" front, 38" x 9" dual rear; 40" x 10" front, 40" x 10" dual rear.

GASOLINE TANK is located under the driver's seat. It has a capacity of 40 gallons. The tank is constructed of 18 gauge terne plate. The header plates are stamped dished section and fastened in place by a lapped and rolled seam joint which is also soldered. Stewart vacuum system is used. The tank has a shut off cock at the bottom. The gas gauge is the dash type.

THE HEADLIGHTS are the new type, having controllable beams. The large bulb has a double filament and produces the high or long distance light for country work on the lower filament, while the upper filament produces a short flood light for city driving. An additional bulb with single filament furnishes parking lights.

The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell finish is chrome plate. The lens comply with all state requirements.

CHASSIS LUBRICATION is accomplished by means of standard Alemite connections placed at all bearing joints and a high pressure Alemite grease gun furnished with each truck as standard equipment.

PAINT. All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.

MODEL 27X—7 TON**Model 27X—Specifications**

Rated Capacity	- -	14,000 pounds.
Wheelbase	- - - -	Standard 165". Special 150", 175", 190", 220" and 235".
Track	- - - - -	Front 70 $\frac{1}{4}$ ". Rear, dual solid, 74 $\frac{1}{4}$ ".
Tire Equipment	-	Front 36" x 7" solid. Rear 40" x 7" duals, solid. Special at extra cost 40" x 8" pneumatic front, 40" x 8" dual pneumatic rear or 42" x 9" pneumatic front and 42" x 9" dual pneumatic rear.
Chassis Weight	- -	9,927 pounds, standard wheelbase.
Body Length	- - -	10' to 20'.
Engine	- - - - -	Six cylinder, size 4 $\frac{3}{8}$ " x 5 $\frac{1}{8}$ ". Piston displacement 462 Cu. In. Horse Power—Actual 100 H.P. at 2000 R.P.M. S.A.E. 45.9. Maximum torque, 275 foot pounds at 900 R.P.M. Cooling—Centrifugal water pump. Carburetor — Stromberg, S. A. E. 1 $\frac{1}{2}$ " flange.
Rear Axle Ratio	-	Standard, 10-1; Special, 8 $\frac{3}{4}$ -1; Special, 11 $\frac{2}{3}$ -1.
Clutch	- - - - -	15 plate, multiple disc, ventilated drum.
Transmission	- - -	Eight speeds, dual unit type consisting of a two speed clutch unit bolted to the engine and a 4 speed main frame transmission. Ratios as follows: High Range—First, 3.21-1; Second, 1.62-1; Third, 1-1; Fourth, .75-1; Reverse, 3.21-1; Low Range—First, 9.38-1; Second, 4.73-1;

Third, 2.92-1; Fourth, 2.18-1; Reverse, 9.38-1; Overdrive on the high range.

Turning Radius - - 28 ft. for standard wheelbase and standard tires.

Brakes - - - - - Foot brakes are four wheel, mechanical. Front $17\frac{1}{4}$ " x 3", rear 21" x $3\frac{3}{4}$ ". The foot brakes are furnished with a B. K. vacuum booster which is standard equipment. Hand brake on rear of main frame transmission, size 11" x 5".

Gasoline Tank - - Located under driver's seat. Capacity 40 gallons. Stewart booster vacuum system. Dash type gasoline gauge.

Frame - - - - - Depth $9\frac{1}{8}$ ", width $2\frac{3}{4}$ ", thickness $\frac{5}{16}$ " alloy steel, heat treated.

Front Springs - - - Size 40" long, 3" wide, 15 leaves.

Rear Springs - - - Size 56" long, 4" wide, 14 leaves in main spring and 6 leaves in helper spring.

Radius Rods - - - Standard equipment.

STANDARD EQUIPMENT: Electric starter, electric generator, electric lights, electric windshield wiper and mirror on all bodies and cabs, electric horn and battery, vacuum tank with booster and gas filter, tool kit, hydraulic jack, rear tire carrier, spare rim, speedometer, air cleaner, thermostat, stoplight, and Alemite grease gun. The instrument board is equipped with ammeter, oil gauge, starting choke button, gasoline gauge, lighting and ignition switch and indirect dash light.

Model 27X—Mechanical Description

ENGINE: Six cylinder, Waukesha engine, $4\frac{3}{8}$ " x $5\frac{1}{8}$ ", completely insulated from the frame by rubber. It is of

the "L" head type with detachable cylinder heads and cylinder block. The cylinders are cast enbloc and the heads in two parts. Exceptional rigidity is given the engine by girder crankcase, truncated cylinder and a heavy seven bearing crankshaft. A special intake and exhaust manifold and the Ricardo head insures maximum power with minimum fuel consumption. The chrome nickel iron cylinder block together with the cast iron pistons make an ideal wear resisting combination. The engine weighs approximately 1150 pounds.

OILING SYSTEM: A screened gear type oil pump located in a sump in the base, forces oil to the seven main bearings, the rod bearings, the cam shaft bearings, the piston pin bearings and to the gear case bearings and gears. In all, 25 bearings are lubricated by oil which is thoroughly cleaned each time it passes thru the motor by a Hall-Winslow Oil Filter which is mounted on the engine.

CRANK SHAFT is made from S.A.E. 1045 steel, heat treated, has seven main bearings of the following sizes:

Front main bearing (dia. x length) 3" x $1\frac{7}{8}$ ".

Center and rear main bearing (dia. x length) 3" x 3".

Four intermediate main bearings (dia. x length) 3" x $1\frac{1}{2}$ ".

The rear end of the crank shaft forging has a heavy flange to which the flywheel is bolted. All main bearings are bronze backed and special alloy lined.

CAM SHAFT is drop forged, with all cams and bearings forged integral and the diam. is $1\frac{3}{8}$ ". The cams are tested with scleroscope to insure the proper degree of hardness.

CONNECTING RODS are forged from S.A.E. 1045 steel and heat treated. A special, long life, bearing material is cast directly into the big ends. They are $10\frac{1}{4}$ " long from center to center. The lower connecting rod bearings are $2\frac{3}{4}$ " diameter by $1\frac{3}{4}$ " long.

THE VALVES are entirely enclosed and the valve chamber is flooded with oil from the engine base. There are two valve cover plates, made of pressed steel. When these plates are removed the valves are easily reached for adjustment. The intake valves are made of chrome nickel steel and the exhaust valves are made of silcrome steel to resist the high temperatures of the exhaust gases. The exhaust valves are $1\frac{3}{8}$ " diam. and the intake valves are $1\frac{5}{8}$ " diameter.

The "Girder" type crankcase practically eliminates all valve burning due to the great depth of metal between the camshaft and valve supports in the cylinders.

PUSH RODS are large in diameter, hollow, case hardened and ground, mushroom type, with lock nut adjustment.

THE FLYWHEEL is attached to the crankshaft flange with six bolts. These are dimensioned bolts and the holes are reamed to size. The flywheel is made of cast iron and a steel ring gear with teeth for the starter is pressed on. The flywheel is machined for multiple disc, dry plate clutch and is carefully balanced to prevent vibration.

THE PISTONS are made of a special fine gray, cast iron. They are $4\frac{3}{8}$ " diameter and $4\frac{1}{2}$ " long. They have four piston rings at the top of the piston. The three top rings are $\frac{1}{8}$ " wide and are the plain cast iron type. The lower ring is $\frac{3}{16}$ " wide and is a special oil wiper ring. All pistons are weighed and held within close limits.

WATER PUMP is of the centrifugal type driven by a shaft from the gear case. There is a water intake manifold running the full length of the cylinder block and insuring an ample supply of cooled water to both the front and rear cylinders.

A THERMOSTAT mounted in the water outlet manifold insures proper operating temperatures under all conditions.

THE FAN is mounted on a bracket on the front of the motor and driven by a "V" belt from a pulley on the pump shaft. The fan runs on roller bearings, has aluminum blades and runs $1\frac{1}{2}$ times crankshaft speed.

THE GOVERNOR. A positive operating governor is built into each motor to protect it from abuse. When leaving the factory this governor is set at 2000 R.P.M.

SPARK PLUGS are located in the top of the cylinder heads. They are metric standard S.A.E. 18 M.M. plugs.

LIGHTING GENERATOR is a Delco-Remy unit delivering a six volt current. It is attached to the motor on the right hand side at the front by standard S.A.E. flange on the gear case housing and is driven by the front timing gears. The generator rotates at $1\frac{1}{2}$ times crankshaft speed. Rotation looking at the driving end of the generator is anti-clockwise.

THE DISTRIBUTOR is mounted on the left hand side of the engine near the front and is driven by means of a set of spiral gears. The rotation, looking down on the distributor, is clockwise.

THE STARTING MOTOR is mounted on the right hand side of the motor at the rear. It is attached to the front face of the flywheel housing by S.A.E. flange type mounting. The starter has a Bendix drive with outboard bearing and meshes with teeth cut in a steel ring gear which is shrunk on the flywheel rim.

STANDARD IGNITION is by battery but a magneto can be furnished on special order.

TRANSMISSION is the multiple speed, dual unit type, consisting of a two speed clutch unit bolted directly to the bell housing of the engine and a four speed main frame transmission, on a three point mounting. This combination gives a selection of eight speeds forward

and two reverse including a low low and an overdrive.

The gears in the two speed clutch unit are made from 3½% nickel steel. They are cut 6-8 and 5-7 pitch and have a ⅞" width of face. After the gears are cut they are first carbonized and then given a double heat treatment which produces maximum hardness on the gear tooth surface and maximum toughness inside. Both the main shaft and counter shaft run on annular ball bearings. The main shaft pilot bearing is No. 304 and the rear bearing is No. 308. The clutch shaft bearing is No. 308. The front and rear counter shaft bearings are No. 306.

The gears in the main frame transmission are made from the same material and given the same heat treatment as the gears in the two speed clutch unit. The teeth are cut 4.5-6 pitch and the gears have face widths from 1" to 1½" according to the load they carry. The pilot bearing on the main shaft is No. 307 and the rear bearing No. 310. The front counter shaft bearing is No. 307 and the rear No. 308.

The following ratios are obtainable: Low Range—First, 9.38-1; Second, 4.73-1; Third, 2.92-1; Fourth, 2.18-1; Reverse, 9.38-1.

High Range—First, 3.21-1; Second, 1.62-1; Third, 1-1; Fourth, .75-1; Reverse, 3.21-1.

Using an 8¾-1 rear axle ratio gives the following ratios to the rear wheels: Low Range—First, 82-1; Second, 41.4-1; Third, 25.6-1; Fourth, 19-1; Reverse, 82-1.

High Range—First, 28-1; Second, 14.15-1; Third, 8.75-1; Fourth, 6.56-1; Reverse, 28-1.

THE CLUTCH is the dry plate, multiple disc type which consists of one set of plain steel and another set of steel discs, lined on both sides with asbestos fabric facings. The steel plates are ⅛" thick, made from saw blade steel and properly hardened. The outside edges of the asbestos covered clutch discs are cut with small gear teeth which fit with similar teeth in the inside face of the clutch driving drum. This method of construction provides large wearing surfaces and prevents noise. The

clutch driving drum is bolted to the flywheel in such a way as to prevent the possibility of its becoming loose. There are a total of 15 plates in the clutch, eight double faced plates and seven plain steel plates together with two header plates. The plates are all 8" outside diameter and 6" inside diameter, which gives a total clutch area of 352 square inches.

The clutch spring is made of a single coil of rectangular spring steel, calibrated to give the exact desired compression which is 750 pounds. However, the clutch pedal has a reduction leverage arrangement which provides a very soft pedal pressure for releasing the clutch.

The clutch shaft is $1\frac{3}{8}$ " diameter, made from $3\frac{1}{2}\%$ nickel steel, heat treated and ground to size. It is piloted into the flywheel with a No. 205 annular ball bearing which is provided with a grease retaining ring.

The clutch release trunnion is equipped with a specially designed ball thrust bearing, which is provided with a grease retaining ring. Both the pilot and clutch throw-out bearings have positive means of lubrication.

THE FRONT AXLE has a drop forged, heat treated, "I" beam of open hearth steel. The beam is $3\frac{1}{4}$ " wide and $3\frac{3}{4}$ " deep. The spring pads are forged integral with the beam.

The wheel spindles are made of nickel steel and heat treated. They are $2\frac{1}{2}$ " diameter at the inside bearing and $1\frac{3}{4}$ " diameter at the outside bearing. The pivot bolt is $1\frac{5}{8}$ " diameter, made of nickel steel, heat treated and ground. The steering ball on the axle is $1\frac{3}{4}$ " diameter. The steering cross rod is a seamless steel tube $1\frac{3}{4}$ " in diameter, and is equipped at each end with ball and socket joints which eliminate all cramping. The track is $70\frac{1}{4}$ ".

The wheel bearings are the latest type Timken roller and are adjustable. The inside wheel bearing is Timken No. 6320-6382, and the outside Timken No. 432-A-535.

THE REAR AXLE is a Timken, full floating, overhead worm drive type. The axle housing is a pressed steel stamping, made from $\frac{3}{8}$ " steel and electrically welded

at the seams. The axle housing is reinforced with nickel steel wheel bearing sleeves.

The worm is made of a special electric furnace, molybdenum steel, carbonized and hardened, with the worm thread ground to extreme accuracy for lead and index thread. The worm shaft is mounted on two Timken roller bearings, No. 78551-78250 at the rear and Hyatt RA-312 at front. The two Timken bearings at the rear are placed back to back so that the worm thrust, in both directions, is taken on these two bearings. The worm front end is finished with S.A.E. $1\frac{3}{4}$ " standard taper.

The worm wheel is made from Timken Special Processed Nickel bronze.

The teeth in the worm wheel are cut with the greatest accuracy. A new form of worm gear tooth has recently been developed which gives these gears about five times the life of the previous type gears.

The worm wheel is securely riveted to a large, four pinion, block type differential. The differential is mounted on two Timken taper roller bearings No. 780-772 which are readily adjustable. The standard gear ratio is 10-1 and special ratio can be furnished $8\frac{3}{4}$ -1 and 11 $\frac{2}{3}$ -1.

The full floating axle shafts are made of nickel chromium, alloy steel and are $2\frac{5}{16}$ " diameter at the smallest section. The inner ends are splined and fit into the differential. The out ends are also splined and fit into the driving flanges which are bolted to the hubs.

The wheel bearings are mounted on the nickel steel, reinforcing wheel spindles which are 4" diameter and made from $\frac{5}{8}$ " stock. This spindle reinforces the axle housing way in close to the differential. Each wheel has two Timken roller bearings No. 772-780 and 6521-6552. The rear axle tread is approximately $74\frac{1}{4}$ " with dual tires.

THE DRIVE SHAFT is made from high carbon, seamless steel tubing $2\frac{5}{8}$ " in diameter. This tubing is carefully selected and tested for true running balance at high speeds.

The Spicer universal joints are tightly enclosed in pressed steel casings of the latest type. The cases are provided with adjustable locks to hold them securely in position. The yokes of the joints are made of molybdenum steel, heat treated and ground to size. All pins and bushings are also of steel and are hardened and ground to accurate dimensions so that all parts are interchangeable. The two and three piece drive shafts are supported by midbearings of the S-K-F self aligning type.

FOOT BRAKES are four wheel, mechanical. The front brakes are Bendix Duo-Servo, $17\frac{1}{4}" \times 3"$. The rear brakes are Timken Duplex $21" \times 3\frac{3}{4}"$. The two sets of Timken rear brakes are connected together so that they operate as one unit. Both front and rear brakes are equipped with moulded linings which give unusually long life. Adjustment is made easy by yokes on the rear brakes. The braking effort is so distributed that about 70% goes to the rear brakes and 30% goes to the front.

The physical effort needed to apply the brakes is very little as the work is done by a Bragg-Kliesrath vacuum booster of the latest type. This is known as their J-6 model and is operated with their XT $\frac{1}{2}$ external valve. The brakes are all internal expanding and are entirely enclosed both front and rear.

HAND BRAKE is located on the rear of the main frame transmission and is supported from the rear transmission cross member. The brake is of the external contracting type. It is 11" in diameter and 5" wide. The brake lining is $\frac{1}{4}"$ thick.

The hand brake should be used only for parking or in case of emergency. The foot pedal which operates the service brakes should be used for all ordinary braking purposes.

STEERING GEAR is the Ross cam and lever type which gives extremely easy steering under all road conditions. Road shocks are reduced to a minimum. The column tubing is $2\frac{1}{4}"$ diameter, is made of seamless steel tubing and finished with baked, black enamel. The steering wheel is 20" diameter.

The steering arm is drop forged and heat treated. It is attached to the shaft by means of a tapered, serrated end and held in position by means of a nut, lock washer and cotter key. The steering arm ball is $1\frac{3}{4}$ " diameter, hardened and ground to size. The spark and throttle controls and the horn button are mounted in the center of the steering wheel. The steering column is tilted at the correct angle to afford a comfortable driving position.

THE FRAME is made of .20-.25 carbon open hearth steel, carefully selected and tested. Samples showing excess phosphorous or sulphur content are rejected. Side rails are heat treated.

The side rails are tapered from front to rear and are $9\frac{1}{8}$ " deep at the center section. The top flange is $2\frac{3}{4}$ " wide and the bottom is $2\frac{3}{4}$ " wide. The thickness of the steel in the side rails is $\frac{5}{16}$ ". Four cross members with heavy gussets are hot rivited to the side rails. The overall width of the frame from front to rear is 36". The length varies with the wheelbase.

SPRING SUSPENSION consists of four semi-elliptic springs. They are made from special alloy, silico manganese steel, carefully formed and heat treated. The front springs are 40" long by 3" wide with 15 leaves. The rear springs are 56" long by 4" wide and have 14 leaves in the main spring and 6 leaves in helper spring. The spring pins are 1" diameter on the front springs and $1\frac{1}{2}$ " diameter on the rear springs. The rear springs are built with auxiliary helpers on top.

THE RADIATOR is the tubular type with cast tanks and side members. The core has three rows of tubes staggered, one tube behind the other. The tubes are surrounded by thin horizontal copper cooling fins which are bent double on the edges for strength. The upper and lower ends of the tubes are held in perforated brass header plates which are bolted to their respective top and bottom tanks. This makes an extremely strong and rugged type of radiator, free from leaks and cracks.

The radiator core is $3\frac{1}{4}$ " thick and has a frontal area of 686 Sq. In. The cooling system holds eleven gallons of water. The bottom tank is made of malleable iron while the side members and top tank are of highly polished cast aluminum.

HEADLIGHT BRACKETS are of polished aluminum and attached to the radiator side members. The radiator is mounted on side rails and is insulated from shocks by rubber mountings.

STORAGE BATTERY is a six volt type, 166 ampere hour capacity and has 17 plates. It has a molded hard rubber case and is mounted in a water tight box on the left hand running board. The battery is held by means of two clamp bolts, in such a way that no strain is put on the case. The battery is easily removable.

THE WHEELS are the steel type with eight spokes which are hollow. They are very strong, although they are but very little heavier than ordinary wood wheels.

THE TIRES. Standard Equipment — front 36" x 7" solids, rear 40" x 7" dual solid. Pneumatic tires at extra cost as follows: 40" x 8" front, 40" x 8" dual rear; 42" x 9" front, 42" x 9" dual rear.

GASOLINE TANK is located under the driver's seat. It has a capacity of 40 gallons. The tank is constructed of 18 gauge terne plate. The header plates are stamped dished section and fastened in place by a lapped and rolled seam joint which is also soldered. Stewart vacuum system is used. The tank has a shut off cock at the bottom. The gas gauge is the dash type.

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The headlights are mounted on S.A.E. adjustable brackets for focusing purposes.

The shell finish is chrome plate. The lenses comply with all state requirements.

CHASSIS LUBRICATION is accomplished by means of standard Alemite grease gun furnished with each truck as standard equipment.

PAINT. All Stewart truck chassis are painted Stewart Standard Green and this applies also to all bodies and vestibule cabs. The fenders and dust shields are given two coats of baked black enamel. The wheels are painted Stewart Standard Red.

TABLE OF WEIGHTS AND MEASURES

Long Measure

12 inches	make 1 foot
3 feet	make 1 yard
5½ yards	make 1 rod
40 rods	make 1 furlong
8 furlongs or 5280 ft.	make 1 mile.

Square Measure

144 square inches	make 1 square foot
9 square feet	make 1 square yard
30¼ square yards	make 1 square rod or perch
160 square rods	make 1 acre
640 acres	make 1 square mile

Avoirdupois or Ordinary Commercial Weight

16 drams	make 1 ounce
16 ounces	make 1 pound
25 pounds	make 1 quarter
4 quarters or 100 lbs.	make 1 hundredweight
20 hundredweight	make 1 ton

Ton—(British and Canadian: generally used throughout Europe)

Equivalent to 2,240 pounds.

Cubic Measure

1728 cubic inches	make 1 cubic foot
27 cubic feet	make 1 cubic yard
128 cubic feet	make 1 cord

Cubic Foot

Equivalent to 1728 cubic inches; 7.480519 (U. S.) gallons; 6.23264 (British "Imperial") gallons; .803563 (U. S.) bushels; .77901 (British "Imperial") bushels.

Liquid Measure

4 gills	make 1 pint
2 pints	make 1 quart
4 quarts	make 1 gallon

Gallon—(U. S. Standard)

Equivalent to 4 quarts. Contain .13368 cubic feet—231 cubic inches.

Gallon—(British and Canadian, known as "Imperial")

Contains 277.25 cubic inches.

Quart—(Liquid Measure)

Contains 57.75 cubic inches.

Dry Measure

2 pints	make 1 quart
8 quarts	make 1 peck
4 pecks	make 1 bushel

Bushel—(U. S. Standard)

Equivalent to 4 pecks—32 quarts—64 pints. Contains 1.2445 cubic feet—2150.42 cubic inches. Average bushel basket measures 18½ inches top diameter; 11½ inches high. Bushel Crate measures 14 inches wide, 17½ inches long and 12¾ inches high.

Bushel—(British and Canadian, known as "Imperial") contains 2218.192 cubic inches.

Barrel—Dimensions vary for different commodities, those most frequently used are:

	Bilge Diameter	Head Diameter	Stave Length	Weight Full
Cement	21	15½	28½	265 380
Flour	21	18	28½	200
Molasses	26	21	35	650
Oil	26	22	34	400
Salt	21	18	29	280
Sugar	25	20½	30	300 360
Vinegar	26	22	35	400

Barrel—(U. S. Standard for vegetables, fruit and dry commodities except cranberries)

Capacity 7,056 cubic inches—105 dry quarts—3.281 bushels.
Head diameter, 17¼ inches; Bilge diameter, 20-37 inches;
Stave length, 27½ inches.

Barrel—(U. S. Standard for cranberries)

Capacity 5,826 cubic inches—87 dry quarts—2.709 bushels.
Head diameter, 16¼ inches; Bilge diameter, 18.62 inches;
Stave length 28½ inches.

Baskets—(U. S. Standard "Climax" for grapes, fruit, etc.)

	Bottom	Top	Bottom	Top	
2 Quart.....	9½	11	3½	5	3⅞
4 Quart.....	12	14	4½	6½	4½
12 Quart.....	16	19	6½	9	7⅞

Beverages, Mineral Waters, Soft Drinks

	Weight in lbs.		Measurements of Case in inches
	Full	Empty	
12 Quarts	45	34	17 x 12½ x 12
24 ½ Pints	40	29	19½ x 12¾ x 10
5 Gallons	66	17	12 x 12 x 17½
6 ¾ Gallons	66	28	19½ x 11½ x 13¼
10 Siphons	57	40	23¾ x 9½ x 11¼
Freight Shipments.			
24 Half Gallons....	180	80	24 x 20½ x 16½
50 Quarts	187	100	30½ x 16½ x 16
100 Pints	113	60	27½ x 13¼ x 23
100 Splits	70	40	24¼ x 13¼ x 20

Liquids

	Barrel		Weighing per gallon
	Weight	Contents	
Alcohol			6.75
Gasoline	363 lbs.	55 Gal.	6.6
Kerosene	385	55	7
Molasses	650	55	12.5
Muriatic Acid			9.62
Nitric Acid			11.7
Oil, fuel	399	55	7.5
Oil, Linseed	400	50	7.5
Oil, Lubricating			7.65

Oil Vegetable			7.65
Petroleum	440	55	8
Sulphuric Acid			15.25
Turpentine	432	51	7.2
Vinegar	400	48	8.4
Water			8.33

Mineral Water

(See "Beverages")

Miscellaneous Commodities

	Lbs. per Cubic Ft.		
Ashes	42	Paper	58
Garbage*	50	Rubber	59
Glass, common	162	Rubber goods	94
Glass, plate or crown	161	Rubbish, paper, rags old furniture, etc.	7.4
Glass, crystal	184	Saltpeter	69
Glass, flint	247	Starch	96
Leather	59	Street sweepings.	31.5
		Sulphur	125
		Wool, pressed	82
Newspaper (rolls) weight 1,200 lbs., length 72", diameter 32".			

*Bodies or containers for this should be constructed of "galvanized" metal.

Building Material

Asphaltum 87 lbs. per cu. ft.
Brick, soft, 4.32 lbs. each, 2.16 tons per thousand, measure $2\frac{1}{4} \times 4 \times 8\frac{1}{4}$ inches.

" common, 5.4 lbs. each, 2.7 tons per thousand, measure $2\frac{1}{4} \times 4 \times 8\frac{1}{4}$ inches.

" paving, 6.75 lbs. each, 3.37 tons per thousand, measure $2\frac{1}{4} \times 4 \times 8\frac{1}{2}$ inches.

" "paving block," 8.75 lbs. each, 4.37 tons per thousand, measure $3\frac{1}{4} \times 4 \times 8\frac{1}{2}$ inches.

Cement, Portland—

Barrel weighs 380 lbs., equivalent to 4 bags.

Bag weighs 95 lbs.

" Rosendale—

Barrel weighs 380 lbs., equivalent to 4 bags.

Bag weighs 94 lbs.

" Western—

Barrel weighs 300 lbs., equivalent to 3 bags.

Bag weighs 88 lbs.

(Cement barrel has following dimensions—Bilge diameter 21", head diameter $15\frac{1}{2}$ ", stave length $28\frac{1}{2}$ ").

Clay, dry	63 lbs. per cu. ft.
Clay, wet	138 lbs. per cu. ft.
Concrete	138 lbs. per cu. ft.
Crushed stone	100 lbs. per cu. ft.
Earth, loose	76 lbs. per cu. ft.
Gravel	95 lbs. per cu. ft.
Lime, per bushel, 75 lbs.	55 lbs. per cu. ft.
Mortar (set)	103 lbs. per cu. ft.
Mud, dry	90 lbs. per cu. ft.

Mud, wet	108 lbs. per cu. ft.
Resin, per bbl., 280 lbs.	45 lbs. per cu. ft.
Sand, dry	97 lbs. per cu. ft.
Sand, wet	118 lbs. per cu. ft.
Stone riprap	65 lbs. per cu. ft.
Tar, weight per barrel	62 lbs. per cu. ft.
Plaster of Paris	98 lbs. per cu. ft.

Coal—Coke

Coal weight per bushel is regulated by law in each state. 80 pounds represents the general average; in Kentucky, Pennsylvania and Montana 76 pounds.

The weight of a bag of coal will average about 100 lbs.

Kind of Coal & Size	Wgt. per Cu. ft	No. cu. ft. per ton
Carterville Egg	51.8	38.6
Carterville No. 2 W. Nut	48.1	41.6
Carterville No. 4 W. Nut	46.1	43.4
Carterville 1½ in. Schs.	54.9	36.4
Cuba, Ill., Screenings	53.6	
Connellsville Coke	26.3	76.4
Erie	48.04	41.61
Free Burning Egg	56.07	35.60
Free Burning Stove	56.33	35.5
Free Burning Nut	56.88	35.16
Harrisburg Screenings	52.8	37.9
Hocking Lump	50.2	39.8
Illinois	47.22	42.35
Iowa Lump	46.51	43.
Indiana Block	43.	46.5
Jackson, Ohio, Lump	54.2	36.9
Kentucky Dean Seam, Lump and Egg.	49.8	40.2
Lehigh Broken	56.85	35.18
Lehigh Buckwheat	54.04	37.01
Lehigh Cupola	55.52	36.02
Lehigh Dust	57.25	34.93
Lehigh Egg	57.74	34.63
Lehigh Lump	55.26	36.19
Lehigh Nut	58.26	34.32
Lehigh Pea	53.18	37.60
Lehigh Stove	58.15	34.39
Ohio Cannel	49.18	40.66
Pike County, Ind., 1¼" Screenings ...	53.2	37.6
Pocahontas Egg and Lump	52.27	38.28
Pocahontas Mine Run	59.6	33.6
Pittsburgh	46.48	43.03
Schuykill Anthracite, Buckwheat	59.6	33.6
Schuykill Anthracite, Chestnut	58.6	34.1
Schuykill Anthracite, Large Egg	43.7	37.2
Schuykill Anthracite, Small Egg	55.	36.4
Schuykill Anthracite, Pea	55.	36.4
Schuykill Anthracite, Range	58.5	34.2
Scranton Anthracite, Large Egg	57.1	35.

Seranton Anthracite, Small Egg.....	56.6	35.3
Seranton Anthracite, Range	54.5	36.7
Seranton Anthracite, Chestnut	57.4	34.8
Seranton Anthracite, Buckwheat	57.6	34.7
So. Wilmington W. Nut and Pea.....	48.8	40.9
Splint Block	46.4	43.1
Susquehanna Large Egg	54.7	36.6
Susquehanna Small Egg	55.5	36.
Susquehanna Range	55.2	36.2
Susquehanna Chestnut	56.1	35.7
Susquehanna Pea	54.6	36.6
Susquehanna Buckwheat	52.9	37.1
Coke	28.	71.43
Charcoal, Hardwood	19.	105.25
Charcoal, Pine	18.	111.11

Metals

	Lbs. per Cubic Ft.		Lbs. per Cubic Ft.
Aluminum, cast	165	Iron, wrought	426.8
Babbitt	440.6	Lead	702.5
Brass, cast	506.3	Manganese	475
Brass, rolled	528	Mercury* (Quick silver)	849
Bronze, aluminum... ..	528	Nickel	548.7
Bronze, phosphor	575.8	Platinum	1,330
Copper	555	Silver	656
German Silver	53	Steel, Bessemer.....	490.7
Gold	1,205	Tin	458.3
Gold, coin (U. S.)....	1,073	Tungsten	1,200
Iron, cast	450	Zinc	436.5

*Shipped in iron flasks holding 75 lbs. and weighing about 90 pounds.

Ore

The weights given below are subject to great variation due to mineral richness and size to which ore has been broken.

	Lbs. per Cubic Ft.		Lbs. per Cubic Ft.
Copper, pyrites.....	262	Manganese	259
Iron, hematite	325	Lead	465
Iron, magnetite	315	Tin	418
Iron, limonite	237	Zinc	253

Bread

Size and weight of loaves are so varied as to prevent arrival at an average weight, the baskets and crates used in bulk delivery also vary greatly, but in order to assist in determining body measurements a length of 34 inches, width of 23 inches and height of 22 inches may be considered an average for the basket used by the large baking companies.

Cotton

Bale weights 515 pounds; measures 27 " x 27" x 54"; contains 23 cubic feet. The new style compressed bale measures 27" x 25" x 54", and contains 20 cubic feet; the weight is the same.

Dairy and Farm Products

Other than Fruit, Vegetables, Grain, Feed and Stock
BUTTER

30 pound tub, top diameter 13½", height 12½".

60 pound tub, top diameter 16½", height 15".

CHEESE

30 pound box, diameter 16½", height 6¾".

60 pound box, diameter 15½", height 15".

CHICKENS

Broilers, per crate 36 lbs., 16 x 16 x 4½".

Fowl, per crate 74 lbs., 16 x 16 x 8".

Roasters, per crate 75 lbs., 19 x 16 x 8".

EGGS

In crates containing 30 dozen, 52 pounds. Crates measure 30 x 12 x 12". (10 pounds.)

MILK

10 gallon can, containing about 87 pounds of milk, weighs 115 pounds, measures 26" high, 14" diameter.

Case of 12 quarts weighs 63 pounds, measures 18¼ x 14¼ x 12". Weight of case and empty bottles, 33 pounds.

Case of 20 pints weighs 54 pounds, measures 18¼ x 14 x 10". Weight of case and empty bottles, 33 pounds.

Farm Products

Weights vary slightly according to laws of different states.

	Lbs. per Bushel		Lbs. per Bushel
Barley	48	Millet	50
Beans	60	Oats	32
Blue grass seed	14	Onions	57
Bran	20	Peanuts	22
Buckwheat	50	Peas	60
Clover seed	60	Popcorn	56
Corn, shelled	56	Potatoes	60
Corn, on the cob, husked	70	Potatoes, sweet	55
Corn, Kaffir	56	Rye	56
Corn, unhusked	74	Timothy seed	45
Corn meal	50	Turnips	55
Flaxseed	56	Tomatoes	56
Hemp seed	44	Wheat	60

Feed, Hay, Straw

Bran, per bushel, 20 pounds.

Oats, per bushel, 32 pounds (put up in bags weighing 80 pounds and containing 2½ bushels).

	Weight	Length	Width	Height
Hay (standard bale)	210 lbs.	46"	30"	26"
Hay (small bale)	120 lbs.	43"	24"	18"
Straw (standard bale) ..	180 lbs...	46"	30"	26"

(Canadian hay is packed heavier—250 lbs. for standard and 145 lbs. for "small" bale.)

To estimate the weight of hay in a mow or stacked on a truck, allow 514 cubic feet for a ton.

Flour

Barrel weighs 200-220 pounds, bilge diameter 21", head diameter 18", stave length $28\frac{1}{2}$ ", 28 pounds per cubic foot.

Fruit

APPLES

Per barrel (3 bushels), 150 pounds.

Per box (1 bushel), 50 pounds.

Per basket (1 bushel) 50 pounds.

BANANAS

Jamaica (firsts) 65 pounds.

Port Lemons, 100 pounds.

These are packed in barrels with hay, which adds about 40 pounds to the weight.

GRAPEFRUIT

Per box ($27\frac{1}{4}$ " x 12" x $12\frac{1}{4}$ ") 80 pounds.

ORANGES

Per box ($27\frac{1}{4}$ " x $12\frac{1}{2}$ " x $12\frac{1}{4}$ ") 80 pounds.

PEACHES

Per basket (1 bushel) 48 pounds.

PEARS

Per basket or box (1 bushel) 50 pounds.

Per barrel (3 bushels) 150 pounds.

Live Stock

Owing to the great variations the following data should only be used in roughly estimating truck carrying capacities.

Calf	150 lbs.	Lamb	75 lbs.
Cow	1,000 lbs.	Sheep	110 lbs.
Hog	240 lbs.	Steer	1,200 lbs.
Horse	1,300 lbs.		

Sugar

Barrel weighs from 300 to 360 pounds; bilge diameter 25"; head diameter, $20\frac{1}{2}$ "; stave length, 30".

Round Timber—to compute the volume.

When all dimensions are in feet, multiply the length by one-quarter of the product of the mean girth and diameter and the product will give the measurement in square feet. When the length is given in feet and girth and diameter in inches, divide the product by 144; when all the dimensions are in inches, divide by 1728.

Lath

Made in lengths of 32 and 49 inches, the latter being the standard. Put up in bundles of 50, averaging 9 inches in diameter and weighing 25 pounds.

Lumber

For purposes of measurement, the "trade" considers a standard board 1 inch thick, 12 inches wide and 12 feet long. Finished lumber, however, measures from $\frac{7}{8}$ to $\frac{13}{16}$ inches in thickness, and any width above 6 inches; anything under the latter measurement is called a "strip".

	Lbs. per Board Ft.		Lbs. per Board Ft.
Ash, black	3.2	Larch	3
Ash, white	3.8	Mahogany	3.5
Basswood	2.5	Maple	3.9
Beach	4	Oak, red	4
Cedar	2	Oak, white	4
Cherry	3.8	Pine, yellow	3.2
Chestnut	2.8	Pine, white	2.5
Elm, rock	4	Poplar	2.8
Elm, soft	3.1	Redwood	2.4
Fir	3	Spruce	3
Hemlock	2.5	Sycamore	3
Hickory	5	Walnut	3.8

Shingles

Packed in bundles of 250 or their equivalent, weighing 50 pounds. Bundle measures 24" long, 20" wide and 10" high. Cork 15 lbs. per cu. ft.

A cord of wood measures 4 x 4 x 8 feet (128 cu. ft.); average weight as follows:

Hickory or Maple	4,500 pounds
White Oak	3,850 pounds
Beech, Red or Black Oak	3,250 pounds
Popular, Chestnut, Elm	2,350 pounds
Pine, White or Norway	2,000 pounds
Hemlock	2,200 pounds

PIANOS

(All measurements given in inches)

	Height	Width	Depth	Weight
"Upright"	57	63	29	609
"Player"	57	63	32	850

Boxed

"Upright"	60	72	31	750
"Player"	60	72	34	1,000

"Grand"—Average length, 5 feet, but owing to the great variations in width between the "Baby" and the "Concert" no general figures may be given. This applies as well to weights.

